

HORIZONTAL MACHINING CENTER

KH-4500

MAINTENANCE MANUAL

KIWA MACHINERY CO., LTD.

(22-02)

PREFACE

We appreciate your selection of our horizontal machining center this machine. This machine allows high precision positioning, linear cutting and continuous circular cutting. This machine has been developed for milling, boring, drilling, reaming, tapping, etc.

This manual provides essential information and instruction necessary for its operation/maintenance.

Please read this manual carefully and thoroughly prior to operation/maintenance of this machine to ensure safety, efficiency and reliable performance for years of operation.

Also, please refer to FANUC's manuals for information concerning programming and automatic operation, etc.

IMPORTANT

This machine has been manufactured and shipped in accordance with the laws and regulations of the country/area first destined. Therefore it is prohibited to export, resell or relocate the machine to other countries/areas.

Moreover, this machine falls in the category of Controlled Products by Japan's Foreign Exchange and Trade Law. Please make sure to contact us or Kiwa's distributor for export, resale or relocation of the machine, including its move from where it is to another place.

KIWA MACHINERY CO., LTD.
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PREFACE

NEVER OPERATE THE MACHINE WITHOUT READING THIS OPERATION MANUAL CAREFULLY. BEFORE HANDLING, YOU MUST UNDERSTAND THE SAFETY PROVISION, AND FUNCTIONS OF THIS MACHINE. BE SURE TO KEEP THIS MANUAL NEAR AT HAND.

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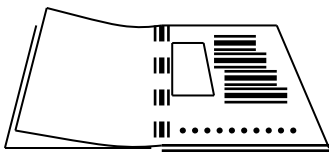
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SAFETY PRECAUTIONS

SAFETY PRECAUTIONS

1. GENERAL

To ensure safe and efficient work, follow the fundamental instructions as below.



Carefully read this instruction manual and make sure you understand the contents.

This instruction manual describes correct procedures of installation and maintenance of the machine with warnings at crucial points. Read this manual before handling the machine, and fully understand the contents. Never attempt to use the machine in any way not described in this manual.

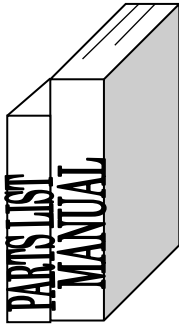
KIWA shall not be responsible for any direct, incidental or consequential damage or injury arising from failure to follow the instructions contained in this manual, or to exercise due care and caution in the installation and maintenance of the machine.

Only personnel trained for the work are authorized to handle the machine.

The machine must be handled only by personnel trained for its proper handling with ample knowledge and authorized by their supervisor. Prescribe a qualification system in your in-shop regulations. Particularly for maintenance and servicing of electrical components, authorize electrical experts with official qualification.

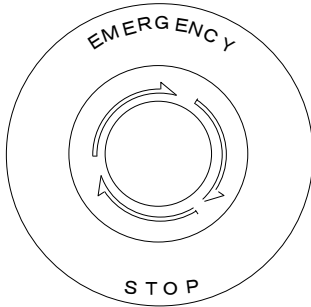
KIWA shall not be responsible for any direct, incidental or consequential damage or injury if people ignorant about proper practices handle the machine.

SAFETY PRECAUTIONS



Always place this manual near the machine.

Keep this manual safely in a designated place of easy access so that you can read it any time necessary. Choose a person to be in charge of keeping it. If the manual is damaged or lost, relay the machine model name and the serial number to your local distributor. A new one will be supplied at your own cost.



All personnel must be aware of the location of EMERGENCY STOP buttons.

All personnel must know the location of EMERGENCY STOP buttons and how to use them in case of emergency.

Never use air blow for cleaning inside machine cover.

For cleaning of cutting chips attached on the covers after machining, never use air blow. If the chips enter the inside of machine, especially under the sliding covers, it may deteriorate machine accuracy and result in machine troubles.

SAFETY PRECAUTIONS

2. Hazardous Areas

High voltage area:

(Hazardous areas where opening the cover and touching the devices inside the cover will result in a serious personal injury or death from electric shock.)

- Electric box
- Operation panel
- Coolant pumps
- Lubrication pump
- Motor
- Terminal boxes

[Only qualified electricians with official licenses are authorized to touch inside these components.]

Machine movable area

- Movable area of spindle head and column
- Movable area of ATC
- Movable area of APC
- Spindle
- Chip conveyer (option)



The chip conveyer may start moving suddenly depending on specification. Be sure to turn the main machine off before carrying out maintenance work on the chip conveyor.

- Spindle cooling unit (option)

[Always keep away from these hazardous areas during automatic operation. Otherwise, turn off the main power correctly by the specified procedure when entering these areas for the purpose of maintenance or other reasons.]

SAFETY PRECAUTIONS

3. Protective Safety Devices

To protect you from accidents as much as reasonably possible, protective safety devices are provided in the machine. Understand their functions before servicing the machine.



- **Never damage, remove or relocate any part of the protective safety devices without KIWA's permission. Doing so could result in serious personal injury.**
- **Before handling the machine, check that all protective safety devices work properly. If not, immediately contact your local distributor.**

List of Protective Safety Devices

NAME	LOCATION	REMARKS
EMERGENCY STOP buttons	on the machine (Machine operation panel) (Machine left-hand side) (Pallet set-up side)	
Main power switch	on the electric box	
Door safety lock	Work set-up doors Operator side door ATC magazine door	
Key	Electric box	
Alarm messages	LCD	

SAFETY PRECAUTIONS

4. Safety Labels

The following warning labels and an instruction plate are attached to the machine. If any label is damaged or becomes illegible, contact your local distributor, immediately. A new one will be supplied at your own cost.



Never remove or disfigure any warning label or instruction plate.

Labels and Plates

- 1) Safety Instruction Plate
- 2) Lightning Mark (Triangle)
- 3) Danger Label (Electric Shock)
- 4) Warning Label (Door)
- 5) Warning Label (Pinch Points)
- 6) Manufacturer Plate

1)

SAFETY INSTRUCTIONS

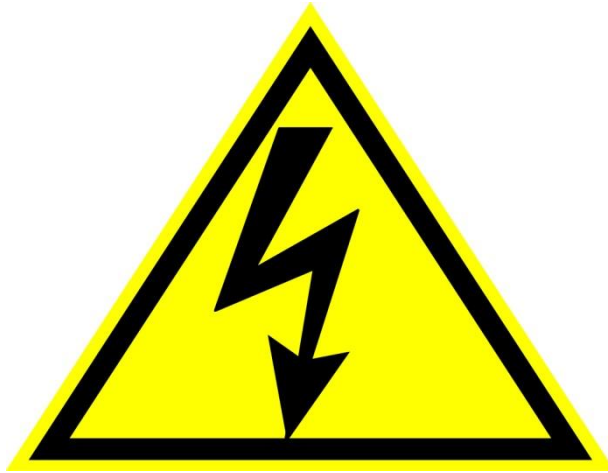
- 1. Only personnel trained for operation or maintenance can handle machine.**
- 2. Read manuals before operating machine. Follow instructions.**
- 3. Always follow instructions written on safety labels.**
- 4. Be aware of location of Emergency Stop pushbuttons.**
- 5. Use water-soluble coolant to prevent fire during unmanned operation.**
- 6. Shut machine off when checking or servicing.**
- 7. Do not operate machine with maintenance covers removed.**

Failure to follow the above could result in serious injury or machine damage.



KIWA MACHINERY CO., LTD.

SAFETY PRECAUTIONS

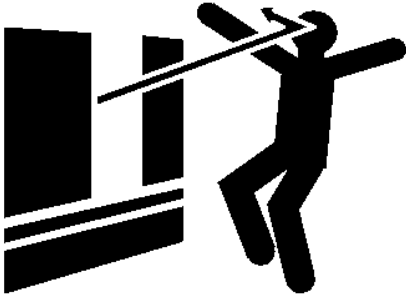

2)



3)

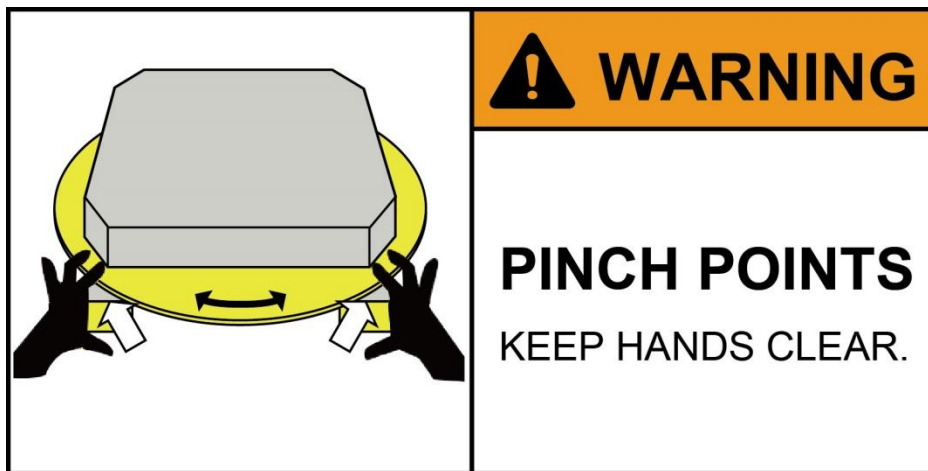
	<div data-bbox="794 969 1273 1070"> DANGER</div> <p>Shut power off before opening door/cover. Failure to do so could result in serious injury or death. Never touch inside soon after shutting breaker off.</p>
--	--

4)

	<div data-bbox="794 1552 1273 1653"> WARNING</div> <p>Always shut doors/ covers during operation. Shut power off for servicing inside doors/ covers.</p>
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SAFETY PRECAUTIONS

5)



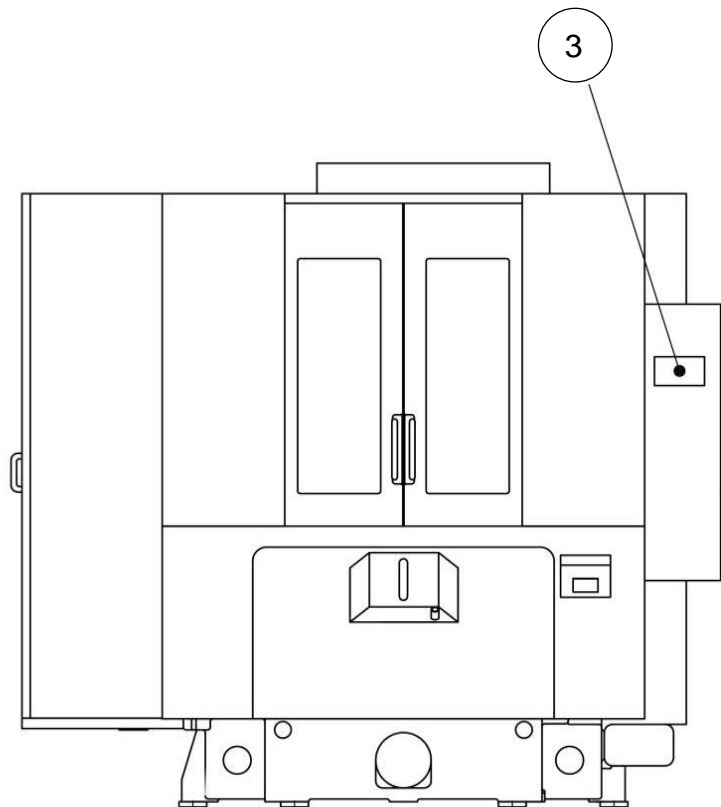
6)

⊕	MACHINING CENTER		⊕
MODEL	<input type="text"/>		
SERIAL NO.	<input type="text"/>		
ELECTRIC VOLTAGE, PHASE, FREQUENCY: AC 200V, 3 ϕ , 50/60Hz			
REQUIRED ELECTRIC CAPACITY	<input type="text"/>	KVA	
MAX. INPUT ELECTRIC CURRENT	<input type="text"/>	A	
SHORT CIRCUIT CURRENT OF MAIN BREAKER	<input type="text"/>	KA	
ELECTRIC DIAGRAM NO.	<input type="text"/>		
MASS (MACHINE ONLY)	<input type="text"/>	KG	
YEAR OF MANUFACTURE	<input type="text" value="20"/>		
KIWA MACHINERY CO., LTD.			
MADE IN JAPAN			
⊕			⊕

SAFETY PRECAUTIONS

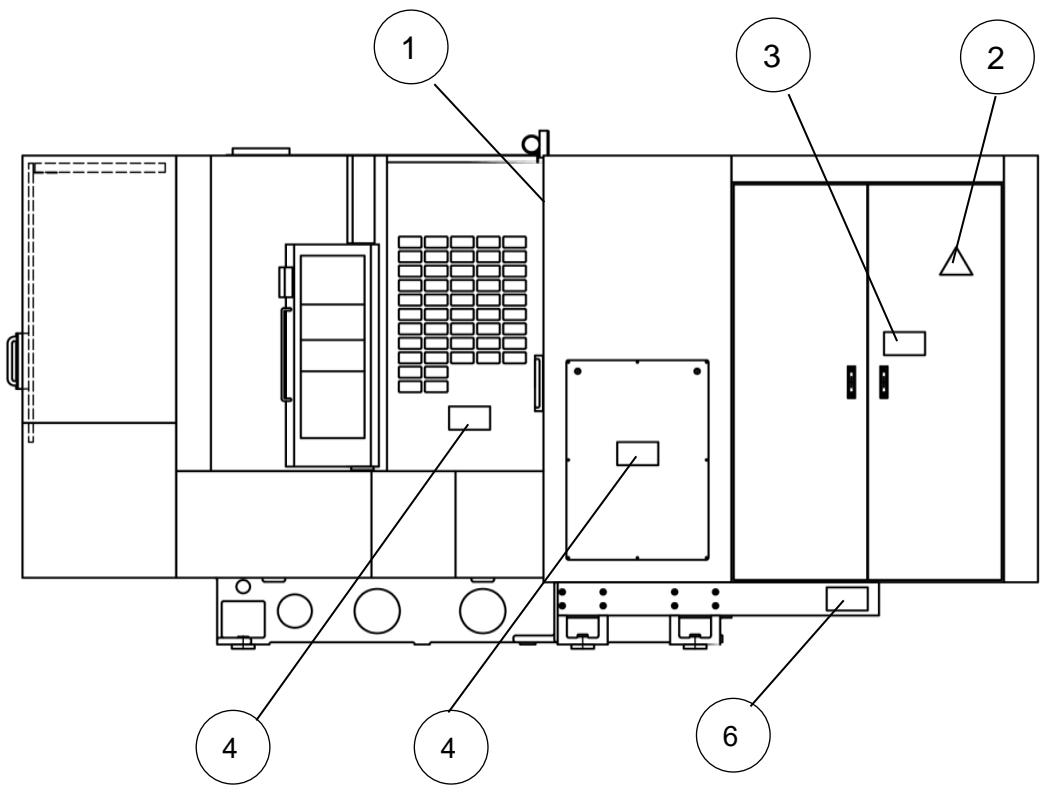
Labels and Instruction for safety are fixed as below:

- 1) Safety Instruction Plate
- 2) Lightning Mark (Triangle)
- 3) Danger Label (Electric Shock)
- 4) Warning Label (Door)
- 5) Warning Label (Pinch Points)
- 6) Manufacturer Plate

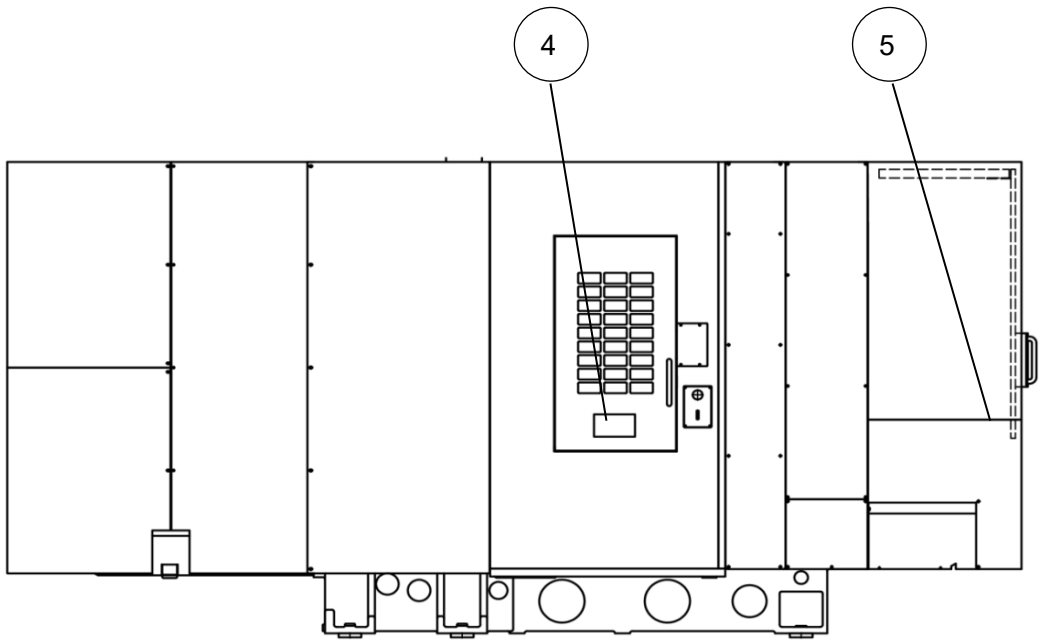


[Machine Front side]

SAFETY PRECAUTIONS

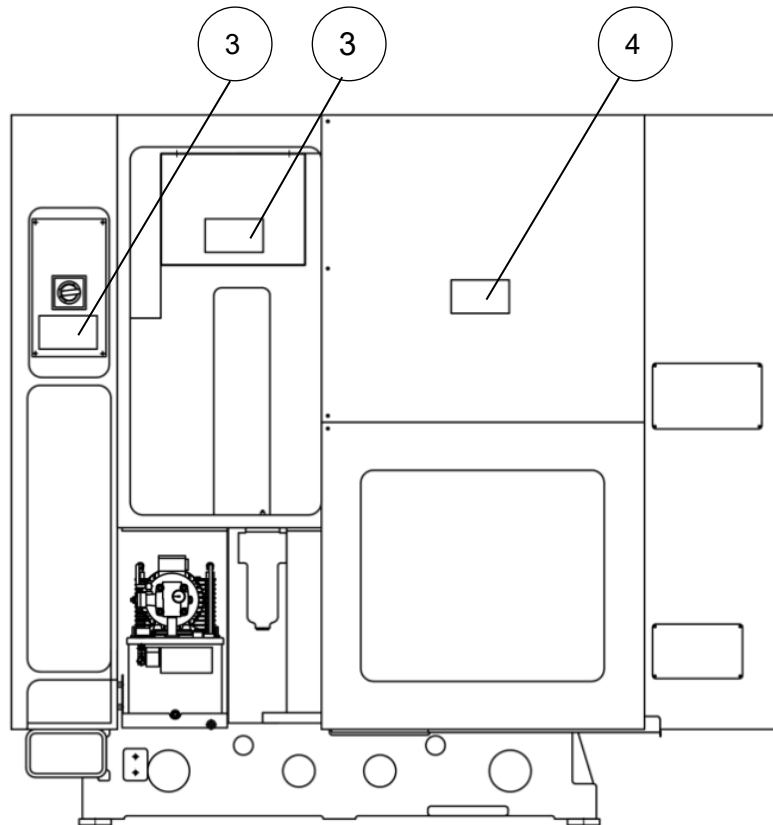


[Machine Right side]

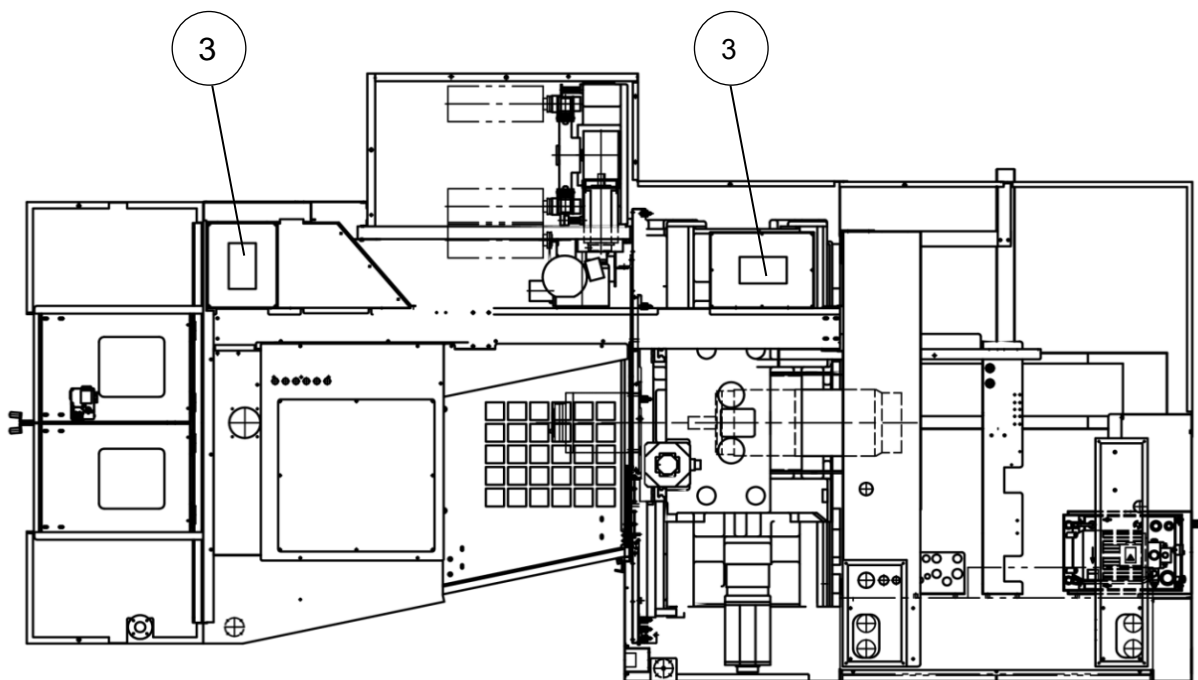


[Machine Left side]

SAFETY PRECAUTIONS



[Machine Rear side]



[Machine Top]

SAFETY PRECAUTIONS

5. Safety Instructions

Safety Instructions are classified into the following three levels. They are subject to the seriousness of possible hazard to personnel or properties. Always follow the instructions, in particular, these of high seriousness.



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

N O T I C E

Addresses practices not related to personal injury.

SAFETY PRECAUTIONS

6. Before Servicing

- 1) Make sure that all doors are closed when turning power on machine. The NC will not get ready if the doors are not closed properly.
- 2) High voltage is applied inside of the electric box. Shut off the factory power source before opening its doors. Remember that input wiring to main switch is powered even when the main switch of the machine is turned off.
- 3) Function and operations not described "possible" in this manual must be considered as "impossible" and must not be carried out.
- 4) Never touch the spindle or the tool while the spindle is rotating.
- 5) Never attempt to clean or inspect the machine while in operation. Be sure to bring it to a complete stop before cleaning or inspection.
- 6) Make sure hydraulic and air supply is shut off before maintenance work.

SAFETY PRECAUTIONS

7. Warnings and Instructions

1) General



DANGER

- Never touch any switch, key or button with wet hand.



WARNING

- Never remove or modify any protective components and/or interlocks without maker's permission.
- Never modify the machine in any way which may decrease the safety of the machine.
- Turn off the main switch when there is a power failure.
- If intense lightning or frequent power failure takes place, stop the operation to prevent accidents by voltage fluctuation.
- Never remove or disfigure any warning labels attached on the machine.



CAUTION

- To avoid accidental activation of switches or keys, never touch them involuntarily or lean against the machine.
- To prevent accidents by slipping, always keep the floor dry. Ensure that floor is free from oil or water.
- Flammable workpieces or liquid must be stored in a place away from the working space, satisfying all national and local safety and health requirements.
- Never handle coolant liquid with bare hands.
- Never allow the operation panel and control box to be subject to impact.
- Never service the machine if affected by alcohol, drugs or other substances or conditions which decrease alertness of judgment.
- Always wear a hard hat, safety shoes, safety glasses (goggles) for maintenance and servicing.

SAFETY PRECAUTIONS









CAUTION

- Never wear a ring, bracelet, wrist watch, or loose-fitting clothing which may be caught in the machine or work pieces.
- Neatly bundle long hair and wear a protective cap to prevent accident by being involved in the machine.
- Wear safety articles, such as leather gloves, for set-ups. Operate the switches and keys on the operation panel without gloves on.

SAFETY PRECAUTIONS

Safety Clothing

Title	Symbol	Description
Helmet		Helmet must be used in case of machine installation in place with risk of falling object.
Gloves		Gloves must be used in case of work with material with spike or cutting edge, oil, coolant, workpiece with dirt of oil or coolant, chips, and so on. Gloves must not be used when working on CNC keyboard or operator panel.
Safety Shoes		Safety shoes must always be used.
Work Clothes		Work clothes must always be used.
Safety Glasses		Safety glasses must be used when using air or coolant gun.
Ear Protector		Ear protector must be used when working with air gun or when it is requested due to the acoustic condition of work place.

SAFETY PRECAUTIONS

2) Installation



DANGER

- Only qualified personnel are authorized to carry out electric connection or hoisting, or to use cranes or forklifts.
- Never put yourself under the raised machine in any event.



WARNING

- Only authorized personnel can move and install the machine according to this manual.
- Check the following at the installation site.
- Clearly mark the foundation bolts if any which are placed under the ground, to prevent personnel from tripping on them.
- Cover up the pits for waste oil, chips or piping, to prevent accidents caused by falling or tripping.
- Remove obstructions from the floor or passages, and wipe away any oil or water on the floor.
- Use a stable step or foothold when working at high or awkward places out of your reach standing on the floor.
- Do not go on top of the machine. When working on parts at high places is unavoidable, use a safe ladder or foothold set by the machine.



CAUTION

- When cooperative work is required, choose a person in charge whose instructions the other personnel must follow. In this case:
- Workers should not proceed without mutual agreement and safety checks concerning all personnel and nearby persons.
- They should also signal to each other before commencing each process.
- Use undamaged wire rope, shackle or lifting jig of the specified size, which can sufficiently withstand the weight of objects.
- Remove the shipping fixtures from the machine before turning the power ON.

SAFETY PRECAUTIONS



CAUTION

- After installation, check the following points before turning the power on.
- All the bolts and connectors are tightened.
- Air hose is correctly connected and tightened.
- The specified amount of fluids are supplied according to the lubrication table in this manual.
- Water and dust are wiped away from the machine.
- There must be no oil leakage under/around the machine.

SAFETY PRECAUTIONS

3) Power ON/OFF



DANGER

- Damaged cable or wire can cause electric leakage or shock. Double-check that there is no damage on cable and wire.



WARNING

- Always obey the instructions about turning power on/off described in the Operation manual.
- Check that protective components and interlock systems are functioning properly.
- All guards must be in place without damage.
- Check the following points after turning the power on.
 - No alarm is indicated on the screen.
 - Pneumatic pressure is appropriate.
 - No abnormal sound is heard from the motors or geared sections.
 - The cooling fans in the electric box are rotating.
 - The spindle and slide ways are lubricated properly.
- Perform the daily check-ups listed in this manual.
- When the machine is to be operated after a long interval, check that the motions, sound and lubrication conditions on the slide ways are all right.

SAFETY PRECAUTIONS

4) Setting-up



DANGER

- Only qualified personnel are authorized to carry out electrical connections or hoisting, or to use cranes or forklifts.
- Never put yourself under the raised object in any event.



WARNING

- Shut the power off and lock up the machine before setting-up. For any reason, if the power cannot be turned off, do the set-up operation allowing easy access to the EMERGENCY STOP buttons.



CAUTION

- Heavy items exceeding 20 kgs must be handled by using an appropriate lifting device, or by two or more personnel.
- Use wire rope or sling of sufficient capacity without disconnection, distortion, corrosion or kink.
- When loosening/tightening bolts, be careful not to lose balance, which may result in touching the machine unexpectedly or falling down.
- Always wear leather gloves for set-ups or cleaning.
- Use a special tool removal jig for removing a tool holder from the tool pot.
- Never leave the tools or instruments used for maintenance work in or around the machine. Put them away in the specified storage space.

SAFETY PRECAUTIONS

5) Closing-down



WARNING

- For cleaning the machine or peripheral equipment, such as chip conveyor (optional), etc., stop all the machine motions correctly and shut the power off the machine.



CAUTION

- Never clean the machine using an air gun. Blown chips may hurt human body.
- Wear gloves for removing chips, etc.
- The solenoid valves remain hot for a while after power is turned off. Be careful not to burn your hands.
- To prevent any foreign matter from getting into the spindle, attach a dummy tool to the spindle if not in use.

SAFETY PRECAUTIONS

6) Maintenance and Servicing



DANGER

- Only qualified personnel are authorized to undertake maintenance and servicing.
- To prevent other people from turning power on or touching the operation panel by mistake during maintenance or servicing, place a tag or placard showing that the maintenance work is under way in a prominent place.
- Before maintenance or servicing, turn off the main breaker. For maintenance in the electric box, in particular, shut off the primary power of the factory, and do not open the electric box door for several minutes because lethal voltage is still present.
- Make sure hydraulic and air supply is shut off before maintenance work.



WARNING

- Never damage, remove or relocate any part of the limit switches, dogs or interlocks.
- Do not go on top of the machine. When working on parts at high places is unavoidable, use a safe ladder or foothold set by the machine.



CAUTION

- Always wear a hard hat for maintenance and servicing.
- Use a stable step or foothold when working in a high place.
- Always use tools suitable for the intended work, ensuring both size and type are correct. Spanners, in particular, must be appropriate for the nut or bolt size and for its location, to prevent unexpected accidents by slippage.
- Clean up after maintenance, remove obstructions from the floor or passages and wipe away oil or water.
- Undertake periodical check-ups as shown in this manual.

SAFETY PRECAUTIONS



CAUTION

- Report your maintenance and service work to your supervisor in the field.
- Record the detail of maintenance and service work for examination by your supervisor from time to time.
- Keep the maintenance record for a reasonable period of time.
- Before maintenance and servicing of the electric box, fix the door to prevent accidents.
- Be careful not to allow water or oil into the electric box, operation panel or terminal boxes.
- Without Kiwa's consent, do not modify parameters.

N. SPECIFICATIONS

N. SPECIFICATIONS

N-1 Machine

Standard Features

RANGE

Column crosswise travel (X-axis)	640 mm	[25.2"]
(Axis Extension)	700 mm	[27.6"]
Spindle vertical travel (Y-axis)	610 mm	[24.0"]
(Axis Extension)	740 mm	[29.1"]
Table longitudinal travel (Z-axis)	680 mm	[26.8"]
Distance between Pallet surface and Spindle center	Min. 50 mm	[2.0"]
	Max. 660 mm	[26.0"]
(Axis Extension)	Max. 790 mm	[31.1"]
Distance between Pallet center and Spindle nose	Min. 100 mm	[3.9"]
	Max. 780 mm	[30.7"]
Table top height (from the floor)	1,069 mm	[42.1"]

TABLE

Table size (x 2 pallets)	400 x 400 mm	[15.7" x 15.7"]
Workpiece max. diameter	750 mm	[29.5"]
Workpiece max. height	1,000 mm	[39.4"]
Max. load	500 kg	[1,102 lbs] each
Configuration	25-M16	P=80 mm [3.1"]
Indexing degree	Min. setting	0.001°
Indexing speed	1.1 sec./90°	

SPINDLE

Spindle speed	150 to 10,000 min. ⁻¹
Spindle max. torque	118 N·m [87.0 ft-lb]
Spindle taper	ISO 7/24 Taper NT No.40

FEED

Rapid feed (X/Y/Z axis)	80,000 mm/min	[3,150 ipm]
Cutting feed (X/Y/Z axis)	1 to 30,000 mm/min.	[1,181.1 ipm]
Table rotating speed	66.6 min. ⁻¹	

N. SPECIFICATIONS

ATC

Type of tool shank	MAS BT40/CAT40
Type of pull-stud	JIS
Number of tools	40 tools and 1 tool in spindle
Max. tool diameter	ø 70 mm [ø2.8"]
Max. tool length	400 mm [15.7"]
Max. tool weight	8 kg [17.6 lbs]
Max. total tool weight	320 kg [700 lbs]
Tool selection system	Random memory
Tool to tool	0.9 sec. (1.7 sec.: Heavy tool)
Chip to chip	2.8 sec. (3.6 sec.: Heavy tool)

APC

Number of pallets	2 pallets
Pallet change	Rotation
APC cycle time	8.4 seconds

MOTOR

Spindle motor	18.5 kW [25 hp]
Feed axes motors (X/Y/Z/B/WA)	4.5/4.5/4.5/2.7/2.5 kW [6.1/6.1/6.1/3.7/3.4 hp] Absolute type
Lubrication pump motor	18W [0.024hp]
Coolant pumps	600 W [0.8 hp] x 3
Hydraulic pump	2.2 kW [2.9 hp]

SUPPLY

Electric power supply	50 KVA, 200V 55 KVA for 6-/8-APC machine (without transformer)
Air supply	0.4 MPa [58 psi] 360 N liters [95 gal] /min.

TANK

Hydraulic unit tank	20 liters [5.3 gal]
Coolant tank	550 liters [145.3 gal]
Lubrication unit tank	1.8 liters [0.5 gal]

N. SPECIFICATIONS

SIZE

Machine height	2,540 mm [100.0"]
(Axis Extension)	2,640 mm [103.9"]
Required floor space	2,398 x 4,539 mm [94.4" x 178.7"]
Machine weight	9,100 kg [20,090 lbs]

MACHINE STANDARD EQUIPMENT

Fully enclosed chip/splash cover
Sealed electric box
Automatic centralized lubrication
(Oil & air system)
Flood coolant system
Leveling screws/plates
Maintenance tools
Operation/maintenance manuals

Optional Features

Spindle max. speed 12,000, 15,000 and 20,000 min⁻¹
6 pallet APC/8 pallet APC
60, 80 and 120 tool ATC
□500 mm pallet
Program end signal light
Through spindle coolant system
Spindle jacket cooling system
Spindle core cooling system (for Built-in type spindle)
Fluorescent lamp
Outside chip conveyor
Inside chip conveyor (Spiral type)
Automatic power-off
Machine color
Interface for danger prevention

**Inch and pound expressions are approximate.
KIWA reserves the right to change design and
specification without notice to effect improvements.**

N. SPECIFICATIONS

N-2 Numerical Control System Specification

Standard Features

CONTROLLED AXIS

Number of controllable axes	4 axes (X, Y, Z, B)
Number of simultaneously controllable axes	4 axes
Least input increment	0.001 mm
Least setting increment	0.001 mm

SPINDLE SPEED FUNCTION

Spindle speed function	5-digit S code
Spindle override	50% to 150% (each 10%)

FEED FUNCTION

Cutting feed override	0 - 200% (each 10%)
Dwell	G04
Zero point return	G27 to G30
Handle feed	0.001/0.01/0.1 mm (per scale of M.P.G.)
Manual Jog feed	0 to 2,000 mm/min. (20 steps)
Dry run	
Rapid traverse rate override	1, 2, 4, 8, 15, 25, 50, 100%
Rapid traverse bell-shaped acceleration/deceleration	
AI contour control II	

TOOL FUNCTION/TOOL COMPENSATION

Tool function	4-digit T code
Tool length measurement	(Option)
Cutter compensation C	G40 to G42
Tool length compensation	G43, G44, G49
Tool offset	G45 to G48 (Option)
Tool offset capacity	200 pcs 400, 499, 999 pcs (Option)
Tool offset memory C	(Option)

N. SPECIFICATIONS

PROGRAM INPUT

Absolute/incremental programming	G90/G91
Canned cycles	G73, G74, G76, G80 to G89
Inch/metric conversion	G20/G21
Decimal point programming	Input by using decimal point
Circular interpolation by R programming	
Subprogram call	10 folds nested
Local/Machine coordinate system	G52/G53
Workpiece coordinate system	G54 - G59
Addition of work coordinate system	48 sets, 300 sets (Option)
Max. programmable dimension	±8-digit
M function	3-digit M code
Custom macro	

EDITING OPERATION

Tape code	EIA RS244/ISO 840 Automatic recognition
Input/output interface	RS232C
Part program storage length	128 Kbyte, 256/512 Kbyte (Option)
Number of registrable programs	63 pcs, 125/200/400/1,000 pcs (Option)
Search function	Program number search, Sequence number search, Address search
Extended part program editing	
Background editing	

OTHERS

MDI/LCD Unit	10.4" Color LCD, Keyboard, and Soft Keys
Programmable Data Input	G10
Rigid tapping	Synchronized tapping
Stored stroke check 1	
Help function	Explanation of alarm messages
Run hour and parts count display	(Option)
Operating monitor display	
Pitch error compensation	
English language display	

N. SPECIFICATIONS

Thread cutting, synchronous cutting

Helical interpolation

Optional Features

Stored stroke check 2

Manual handle interruption

Single direction positioning

Cylindrical interpolation

F1-digit feed

Addition of optional block skip

Polar coordinate command

Optional chamfering/corner R

Program mirror image

Scaling

Coordinate system rotation

Tool offset memory B

Tool life management function

Playback function

Multi-language display

(Chinese/French/German/Italian/Korean/Spanish)

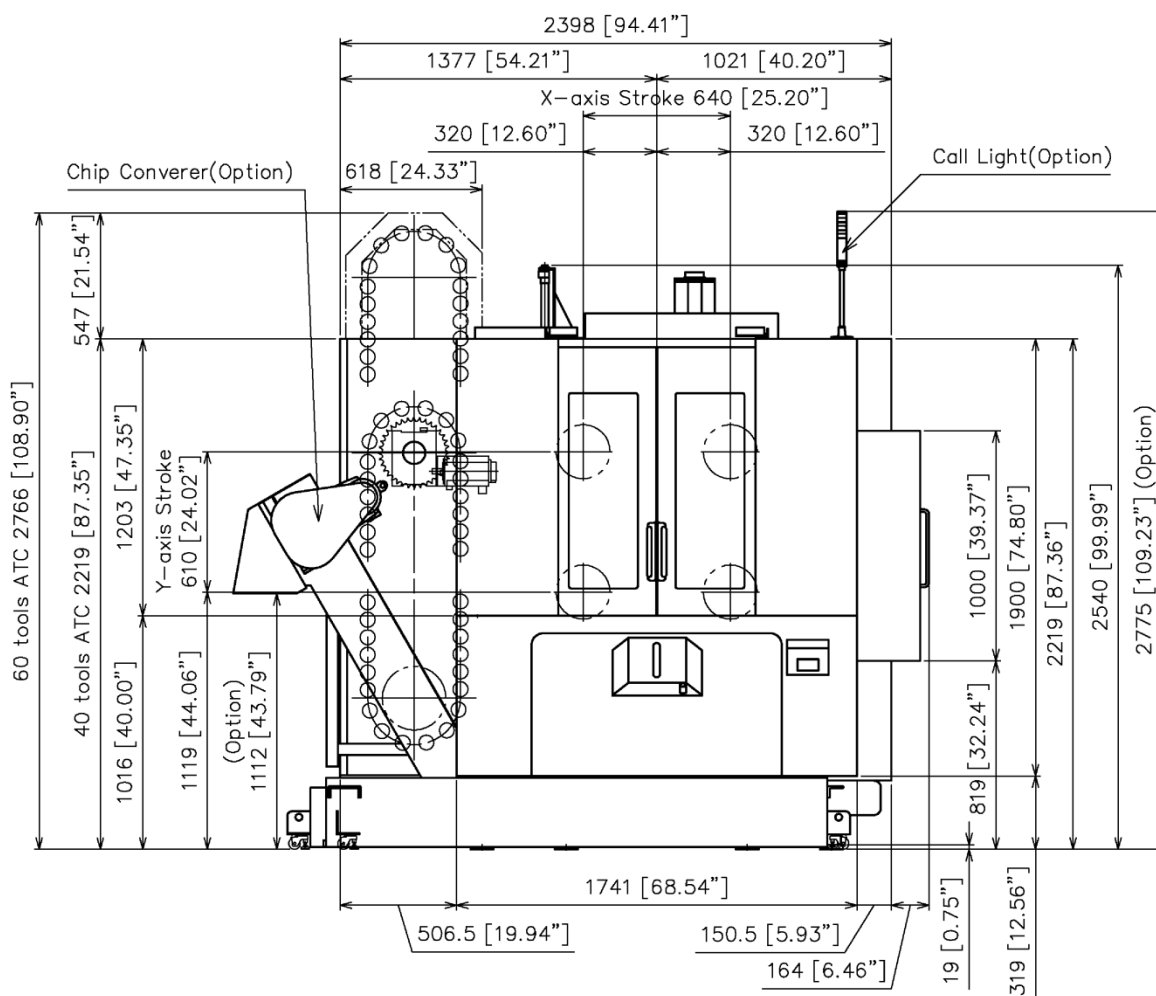
N. SPECIFICATIONS

N-3 Machine Dimensions

Front View

(Standard 40/60ATC)

mm [inch]



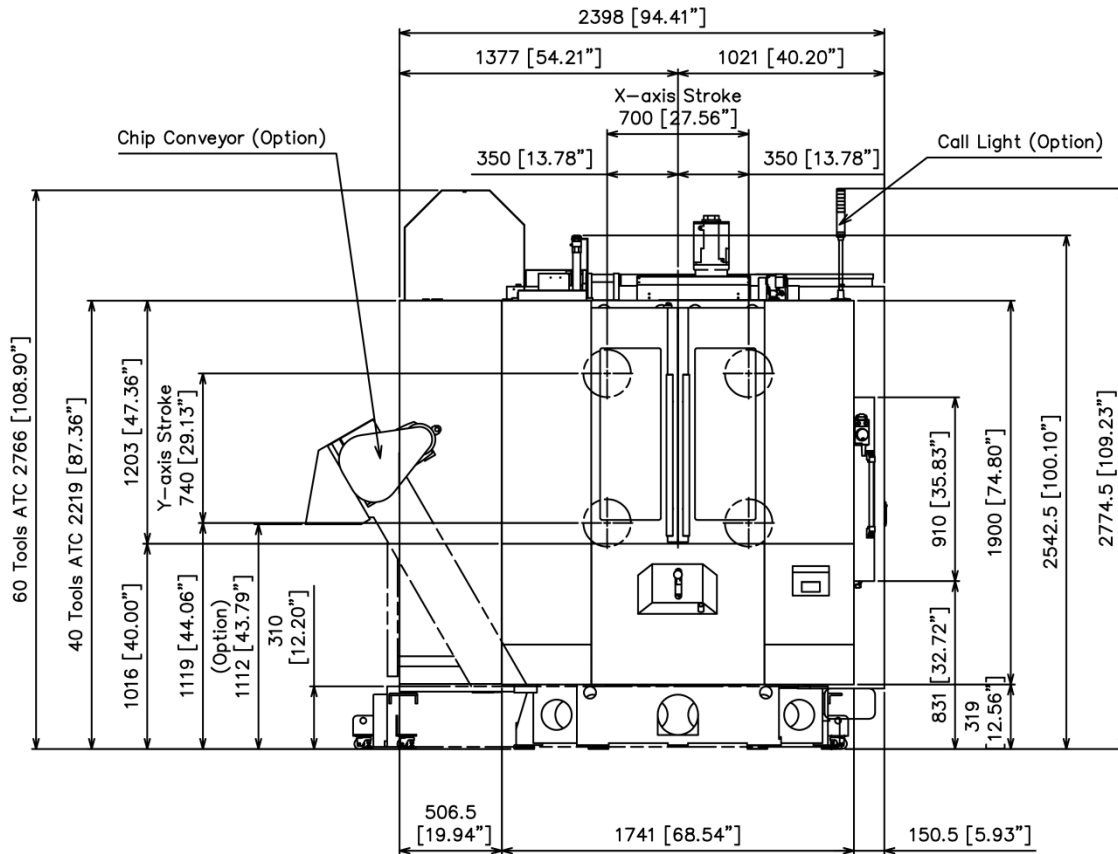
Note: Dimensions in inch are approximate.

N. SPECIFICATIONS

Front View

(Axis Extension 40/60ATC)

mm [inch]



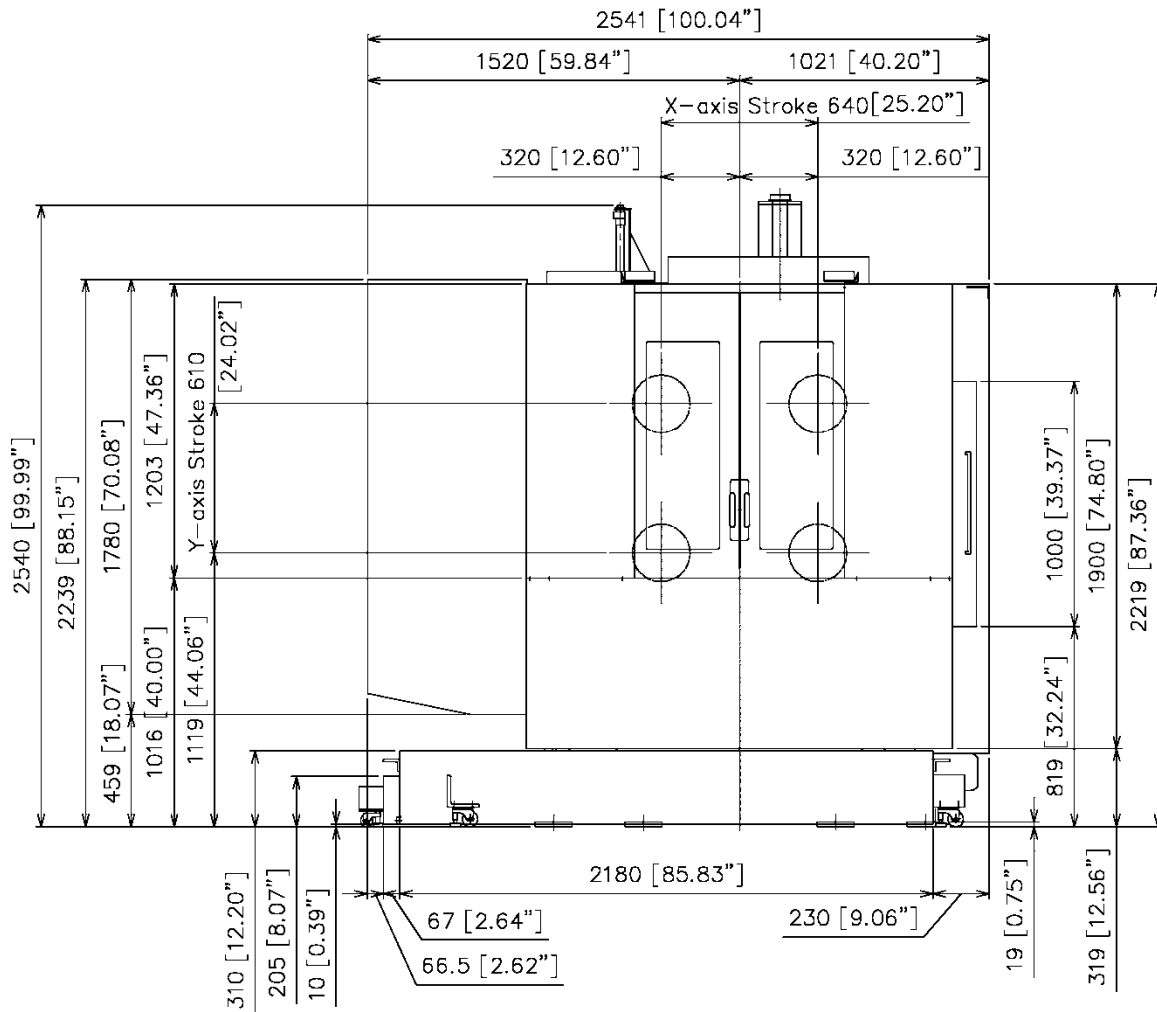
Note: Dimensions in inch are approximate.

N. SPECIFICATIONS

Front View

(Standard 80/120ATC)

mm [inch]



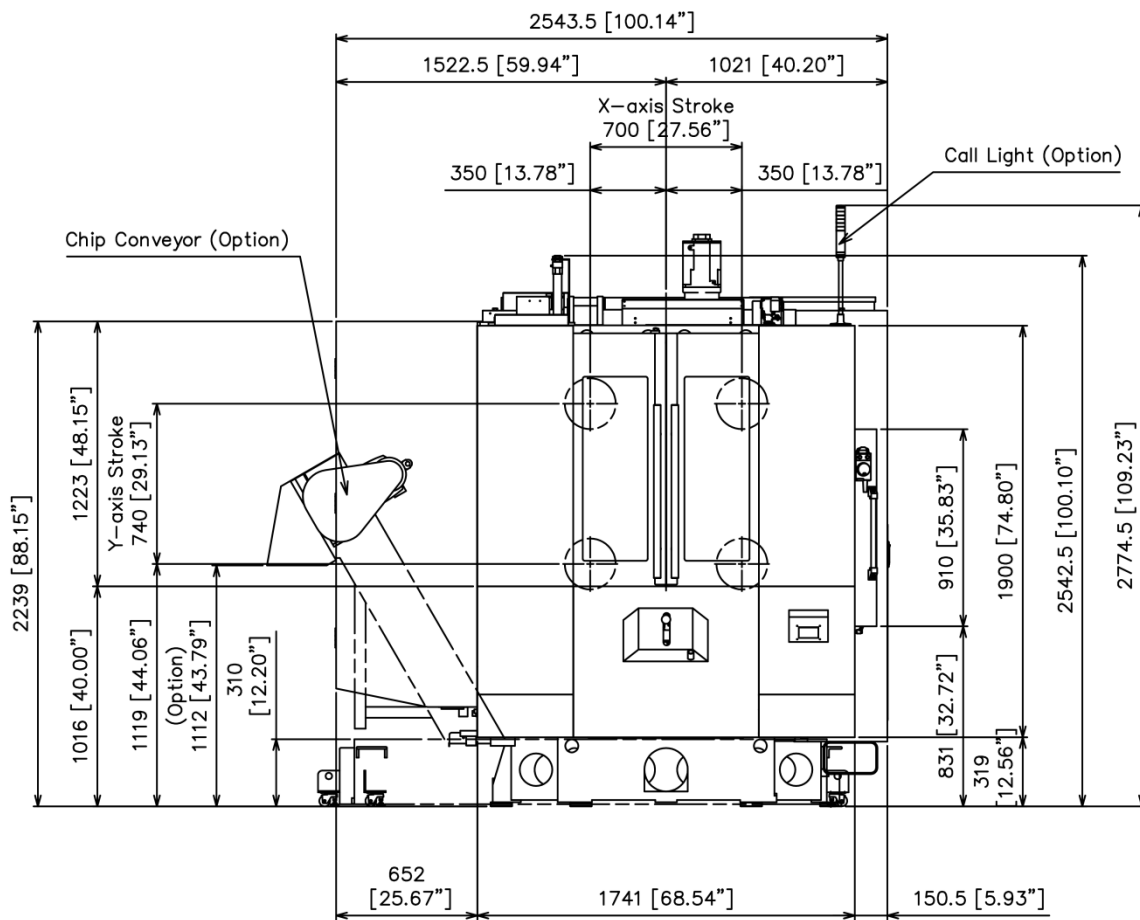
Note: Dimensions in inch are approximate.

N. SPECIFICATIONS

Front View

(Axis Extension 80/120ATC)

mm [inch]



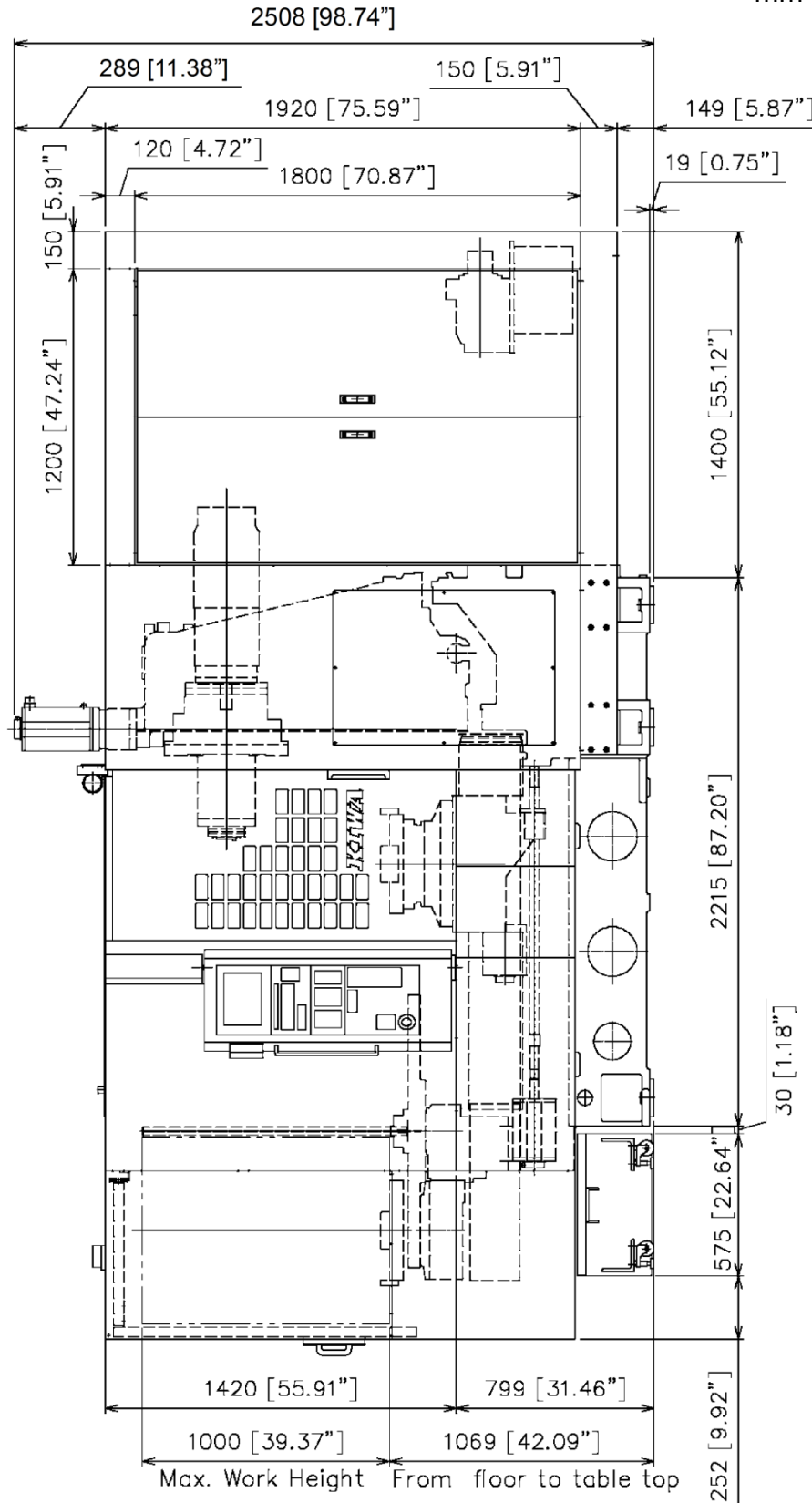
Note: Dimensions in inch are approximate.

N. SPECIFICATIONS

Side View (Operator side)

(Standard)

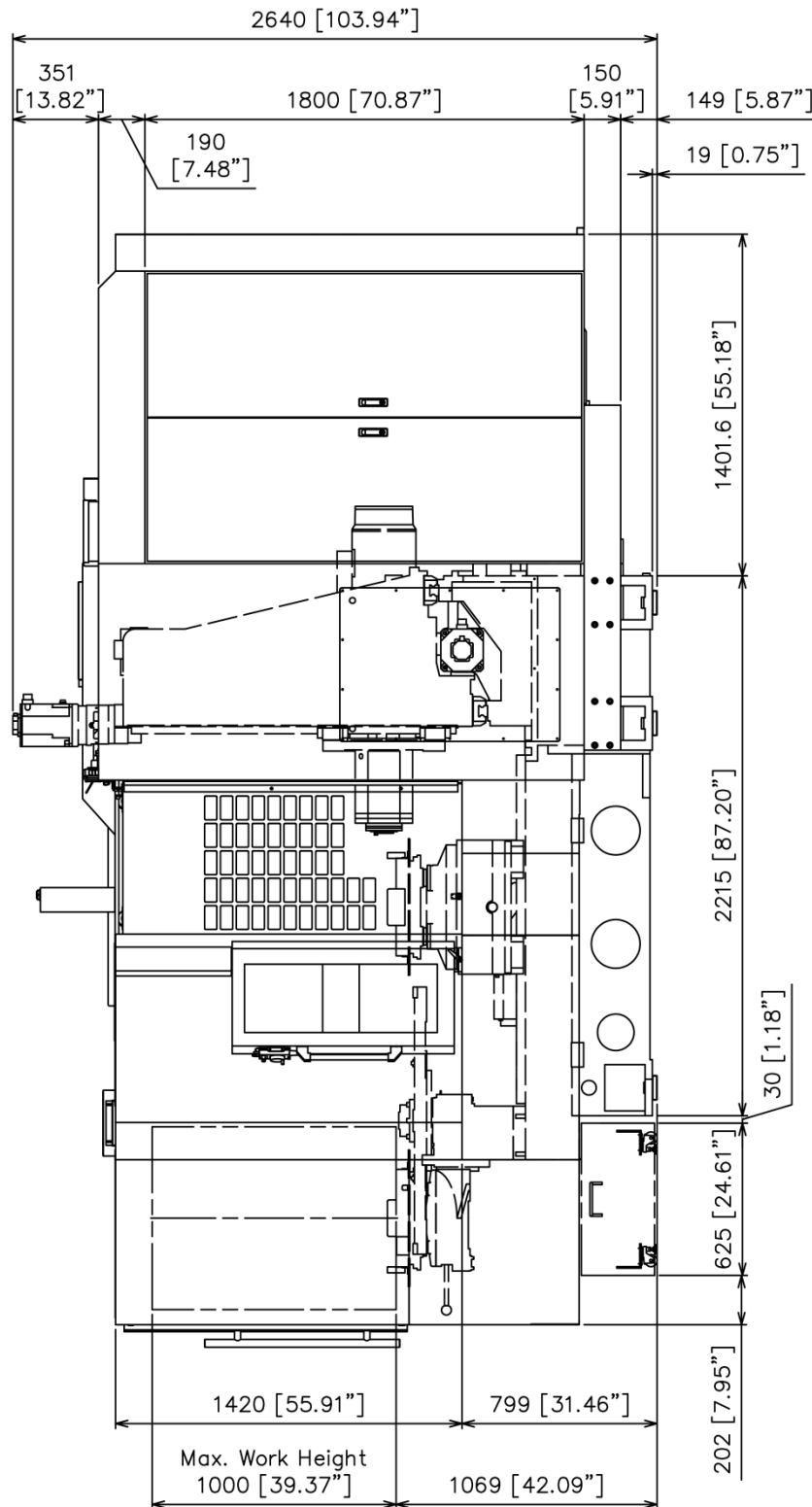
mm [inch]



N. SPECIFICATIONS

Side View (Operator side)
(Axis Extension)

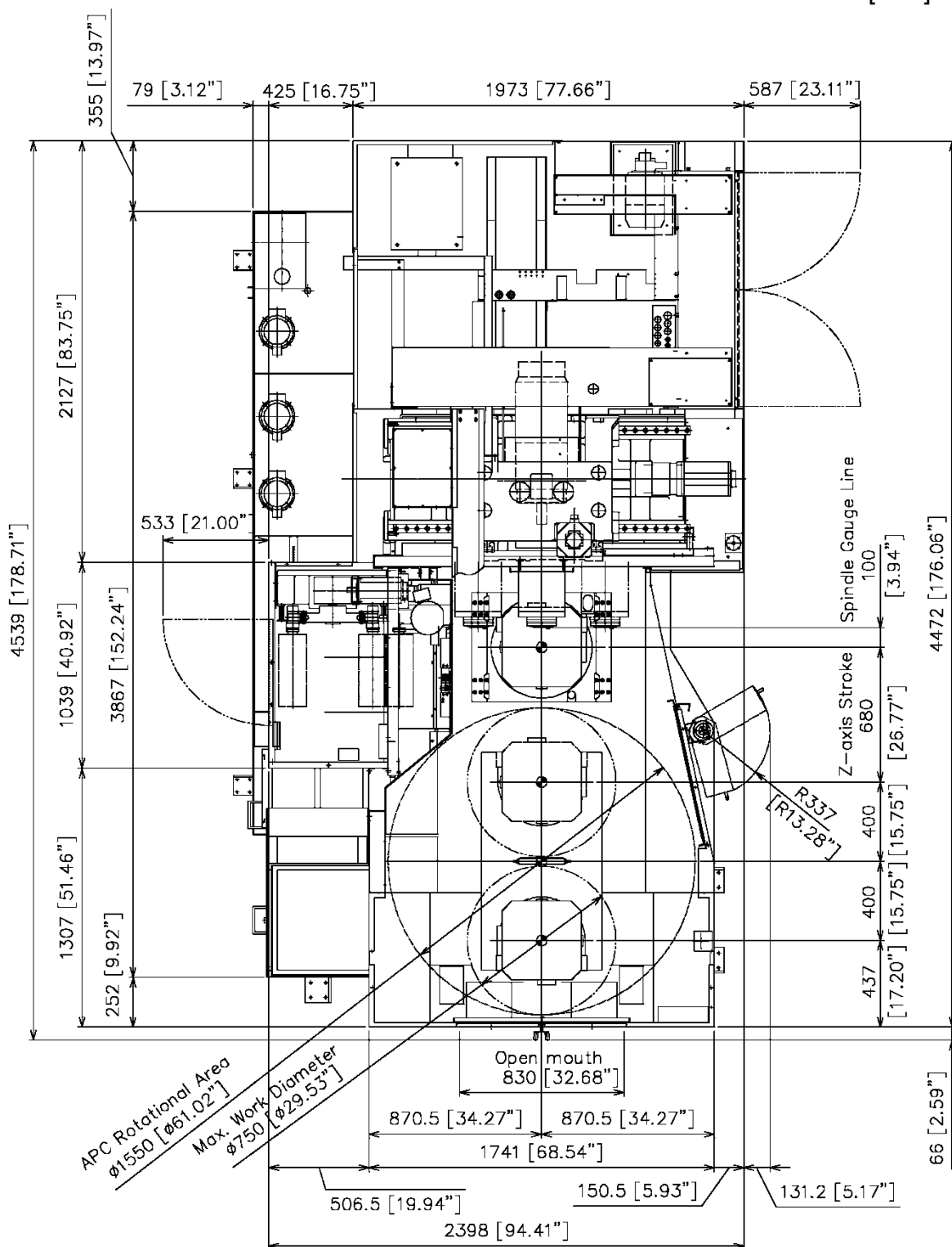
mm [inch]



N. SPECIFICATIONS

Top View
(40/60ATC)

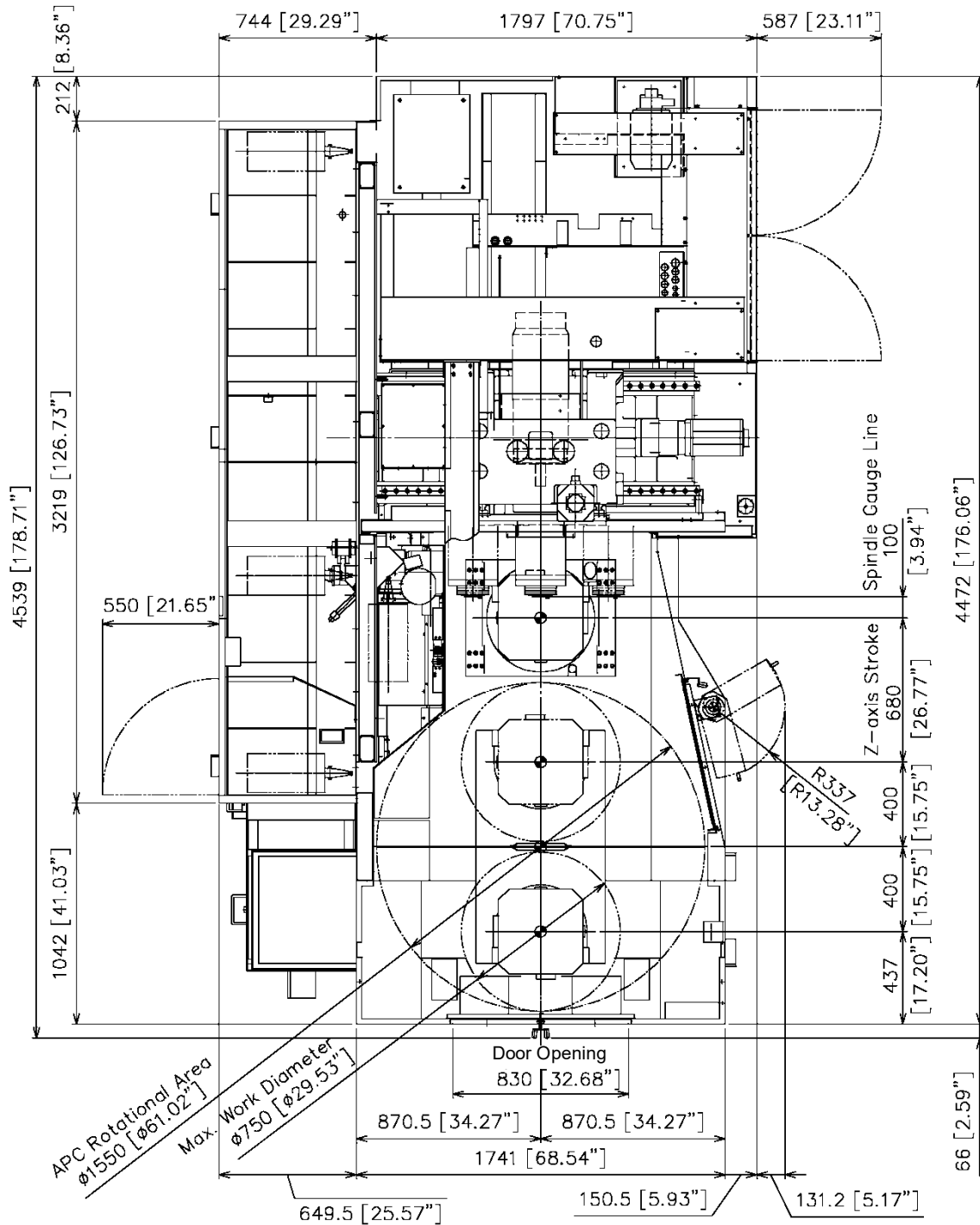
mm [inch]



N. SPECIFICATIONS

Top View
(80/120ATC)

mm [inch]

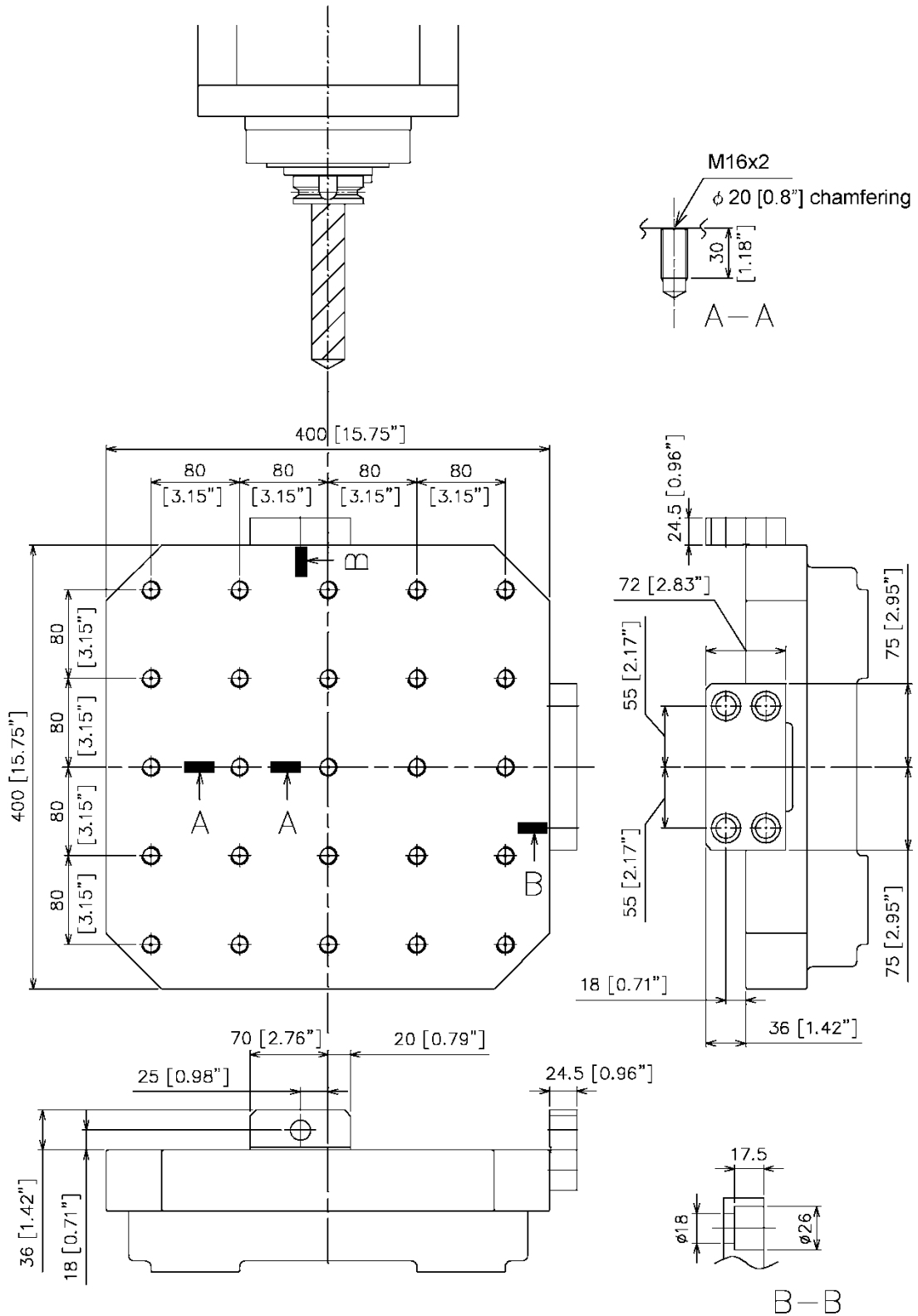


N. SPECIFICATIONS

N-4 Pallet Dimensions

□400mm Pallet dimensions (Standard)

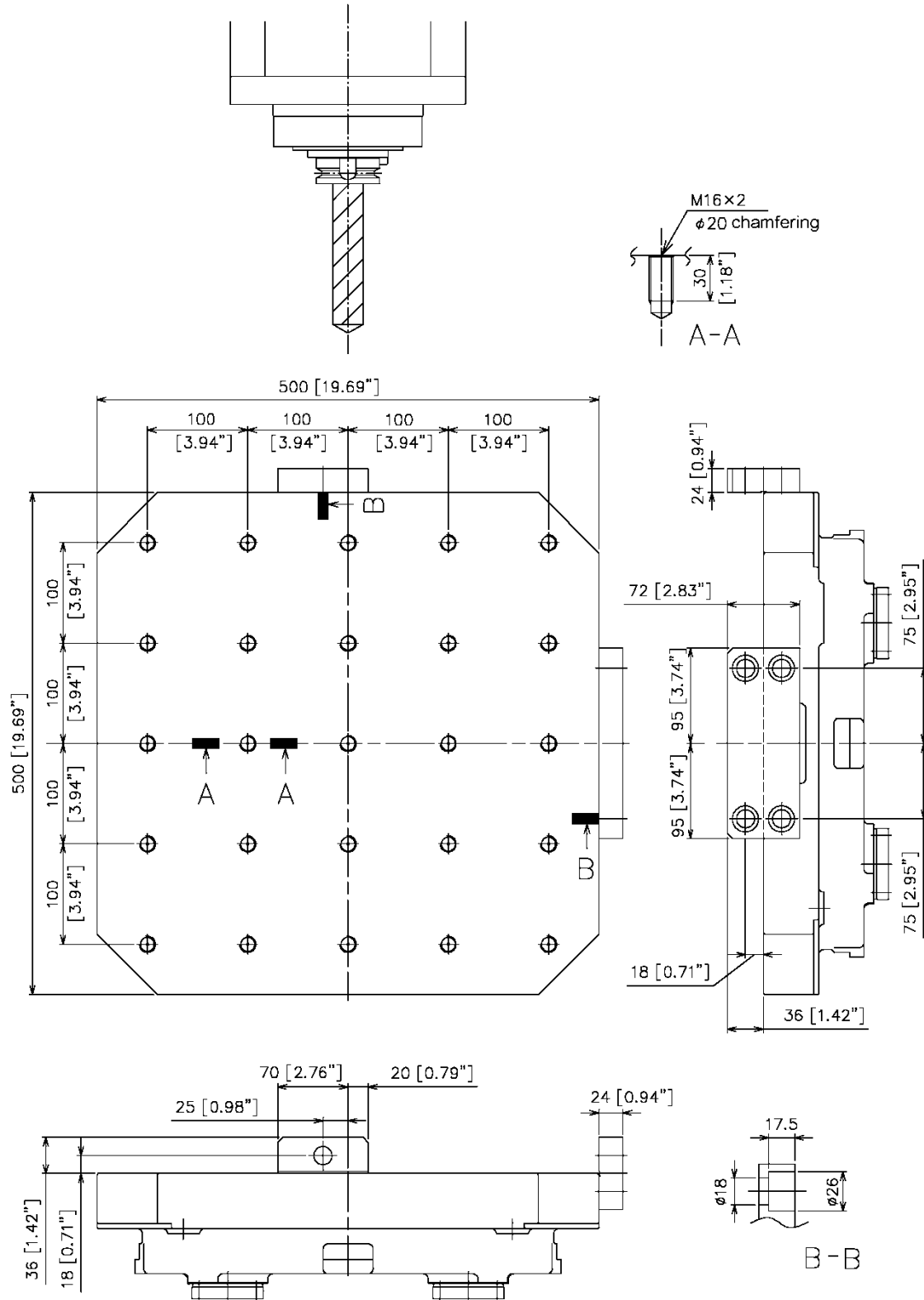
mm [inch]



N. SPECIFICATIONS

□500mm Pallet dimensions (Option)

mm [inch]



O. INSTALLATION

O. INSTALLATION

O-1 Environment

For long life with accuracy of the machine, select an installation site which satisfies the following conditions.

1. No vibration source, such as press machines near the machine, no roads of heavy traffics, etc. If the machine is unavoidably installed near a vibration source, take appropriate measures against vibration.
2. Ambient temperature and humidity around the machine should be kept at uniform within the following ranges. This largely influences machining accuracy.
Temperature in the factory :17°C ~ 20°C
Humidity in the factory :40~75%
3. Heat source is away from the machine.
4. The machine is not exposed to the direct sunlight.
5. Ambient atmosphere should not include organic or corrosive gas or mist.
6. There should not be much dust or particulate matter around the machine.

O. INSTALLATION

O-2 Foundation

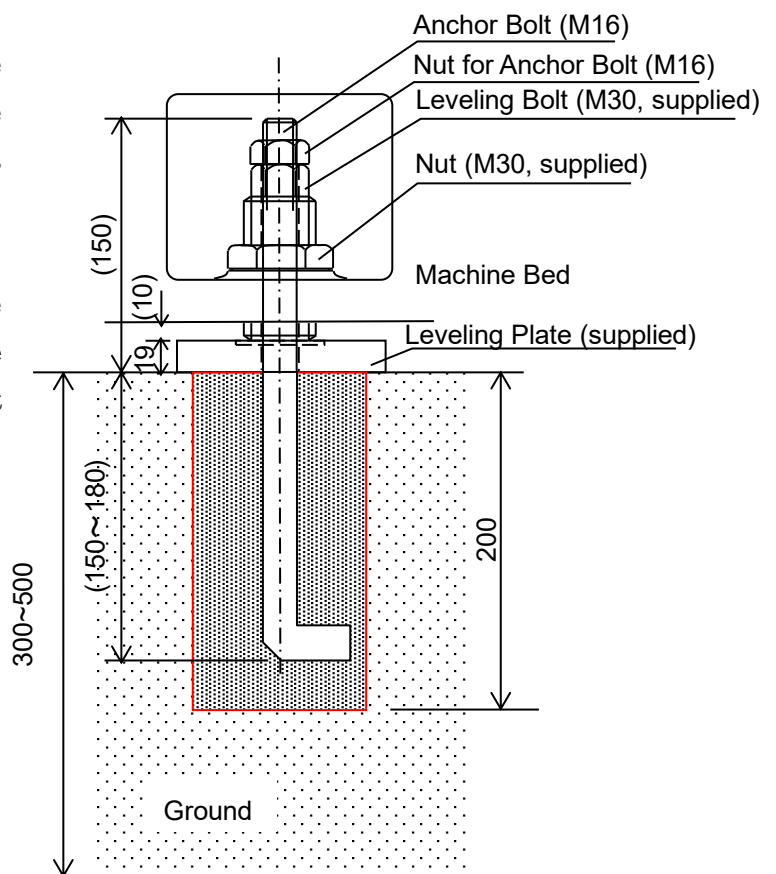
When the ground is strong enough, special foundation work is unnecessary for installation. However, in the following cases, carry out the foundation work as shown on the next page.

1. The ground is weak, and it may cause sinking or inclination of the machine.
2. Higher accuracy and performance are required.
3. High accuracy machining is required for longevity.

Anchoring of the machine

If the machine is a standard one (without 1G option), the machine body won't usually move with axis movements.

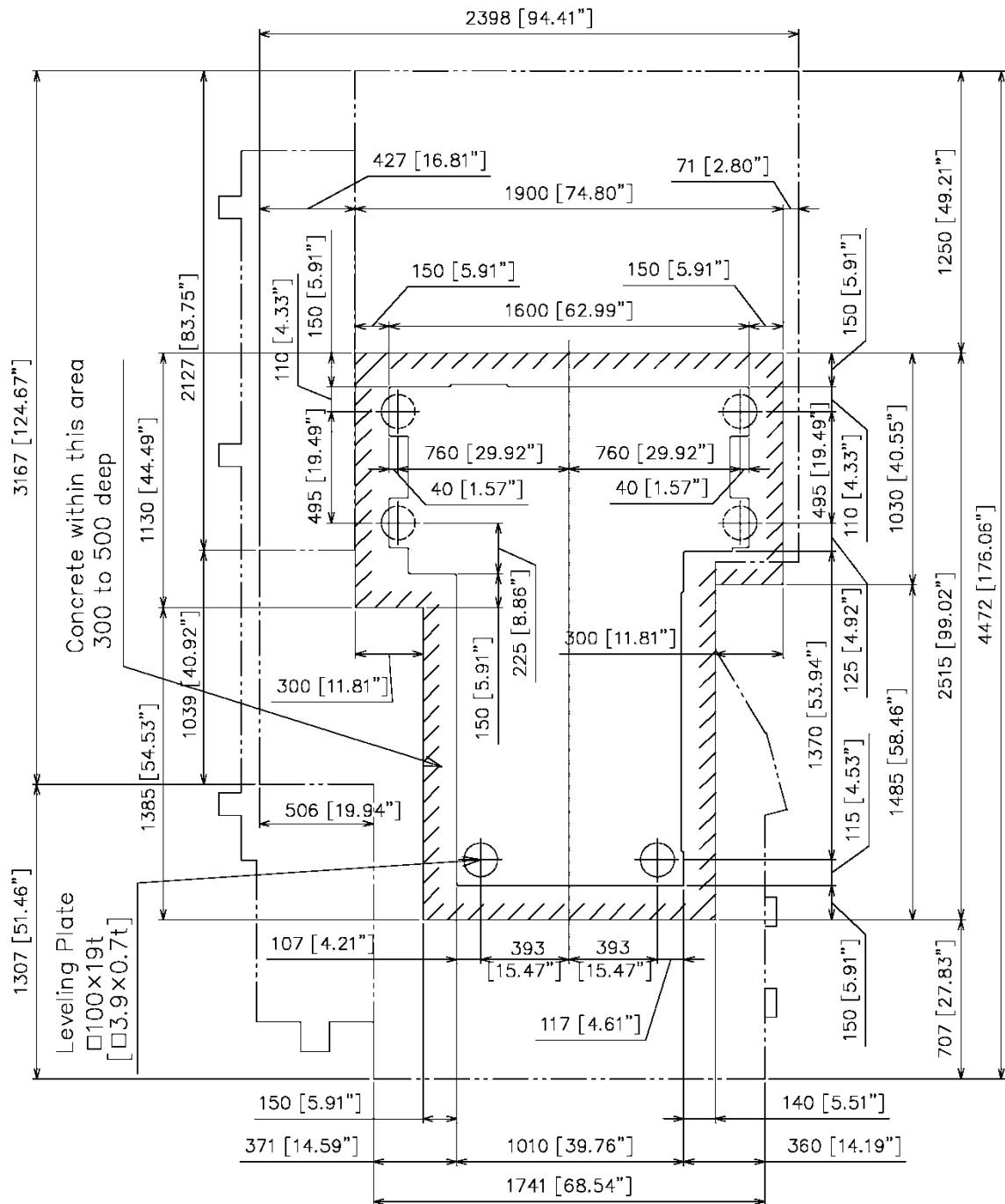
However, if the machine has the 1G option, be sure to anchor the machine to the floor to prevent it from moving with axis movements.



O. INSTALLATION

Foundation Drawing (40/60ATC)

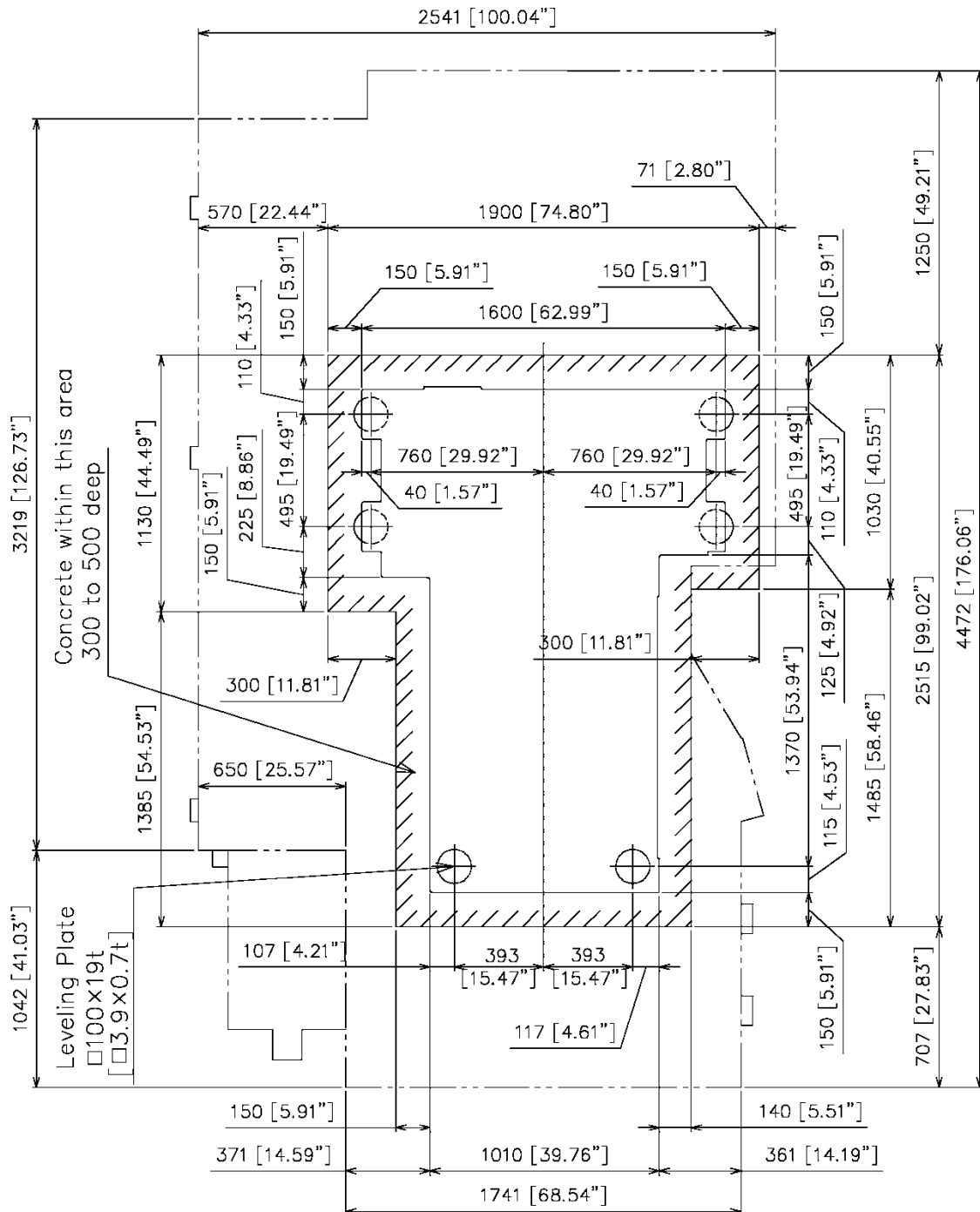
mm [inch]



O. INSTALLATION

Foundation Drawing (80/120ATC)

mm [inch]



O. INSTALLATION

O-3 Hoisting

When hoisting the machine, be sure to hoist/lift the machine as shown on the next page.



- Only qualified personnel are authorized to carry out hoisting, and to use crane or forklift.
- Never go under the lifted machine in any event.



- When a cooperative work is required, determine a chief person whose instructions the other personnel must follow. In this case:
 - Check the safety of the intended work each other.
 - Give signals each other before respective works.
 - Use wire rope, chain, shackle or lifting jig of the specified size without damage, which can sufficiently withstand the machine weight.

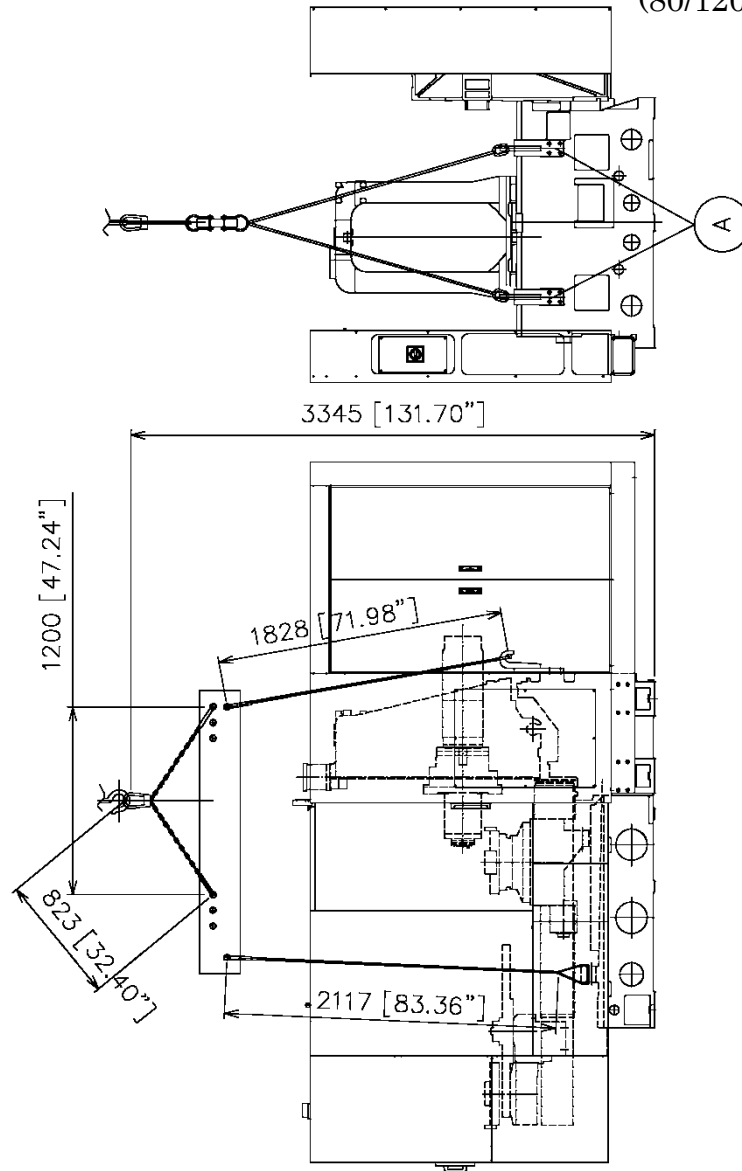
O. INSTALLATION

Hoisting

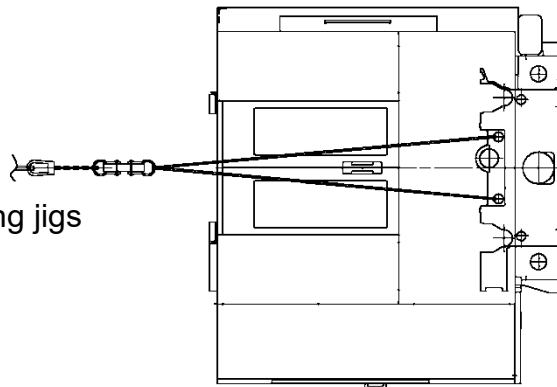
Total weight: 9,100 kg

(80/120ATC: 9,400 kg)

mm [inch]



Remove all the lifting jigs
(A) after putting
the machine down.



O. INSTALLATION

O-4 Unpacking and Cleaning

After unpacking, remove rust preventive applied on the slide covers and metallic sections of the machine, using non-flammable wash oil.

NOTICE

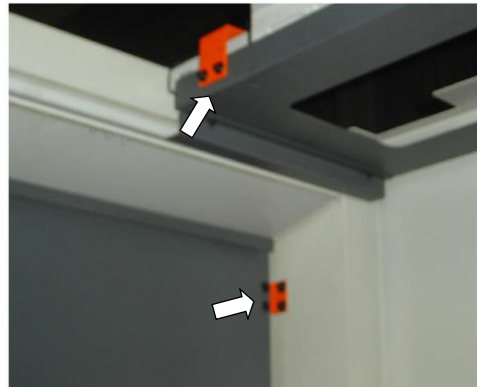
1. The rust preventive agent can get very hard. Please **remove it completely.** Otherwise, it can damage machine parts such as wipers of the slide covers when they move with rust preventive agent left on them.
2. Never use compressed air like air guns for cleaning.

Fixtures for shipment are painted in orange. Please remove all the fixtures at installation, and keep them for future move.

1) Setup Doors and Revolving Door



Machine Front, Left

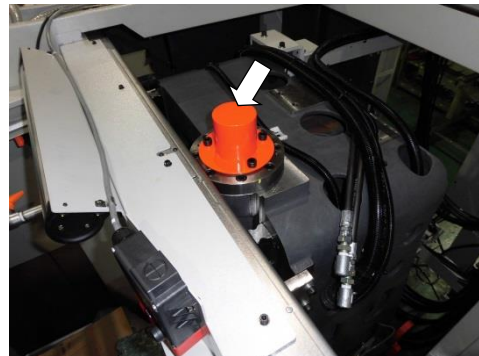


Machine Front, Right

2) Operator Door



Top of Operator Door



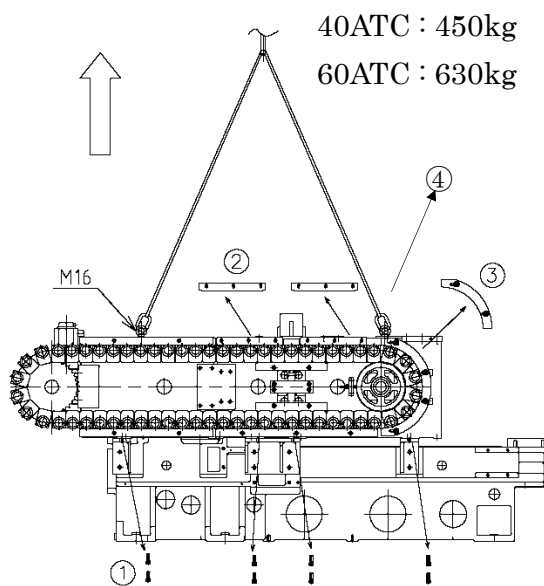
Y axis Cover (Axis Extension)

O. INSTALLATION

O-5 Machine Installation

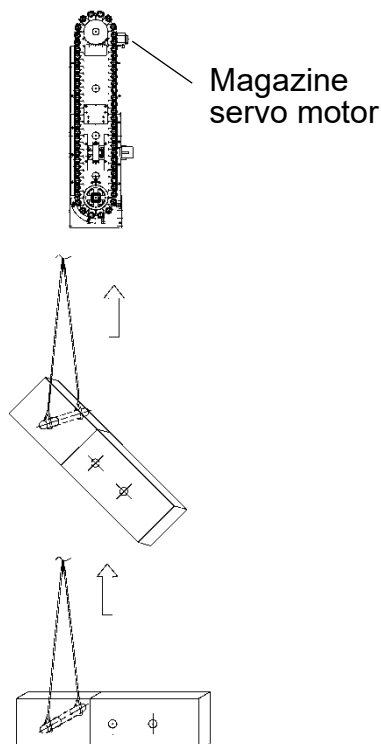
O-5-1 ATC Magazine (40/60ATC only)

At shipment, the ATC magazine is removed and temporarily attached to the machine bed.



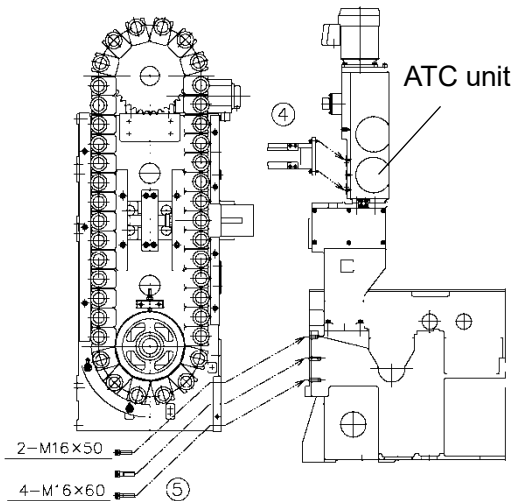
Procedure

1. Remove Tool pot slider (4) that is attached on top of the magazine by a string (see Step 5).
2. Hoisting the magazine, remove eight Bolts (1) from under the magazine, then put the magazine down, and remove the three brackets for transportation from the machine bed.
3. Remove Tool pot guides (2) and (3), three pcs in all, from the magazine (this is for convenience of later work).
4. Put a rod through the hole in the magazine and hoist it in a vertically position with the magazine servo motor on top.

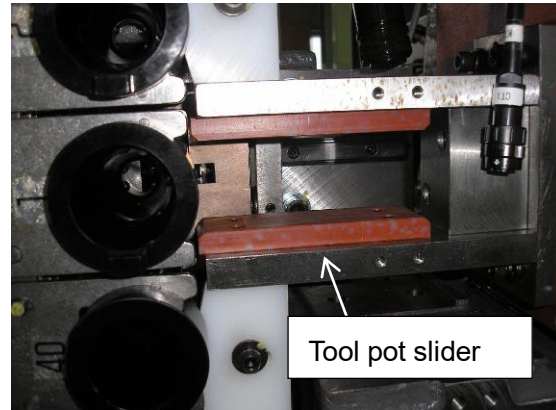


O. INSTALLATION

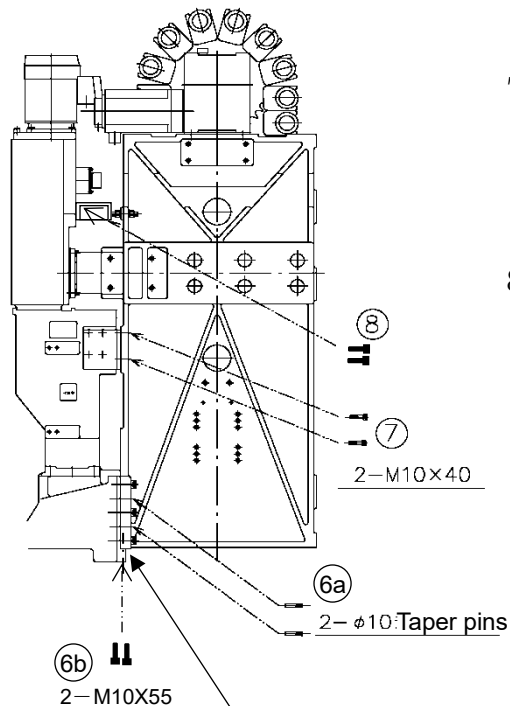
(40/60ATC only)



5. Attach Tool pot slider (4) to the ATC unit.



6. Put the lower edge of the magazine on the shoulder part of the machine bed and fix it temporarily by two M16x50 bolts and four M16x60 bolts as shown at left (5).



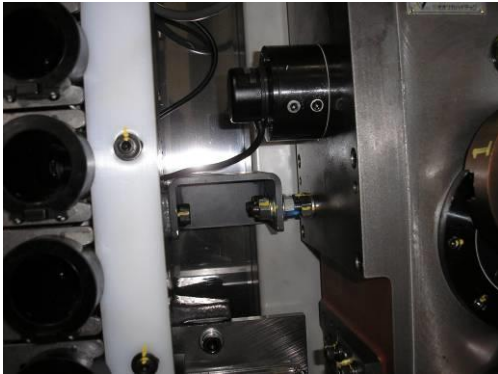
7. Insert two Taper pins (6a) and fix the magazine at the bottom by two M10x55 bolts (6b).
8. Fix the middle part of the magazine to the machine by two M10x40 bolts (7), as shown on the photo below.



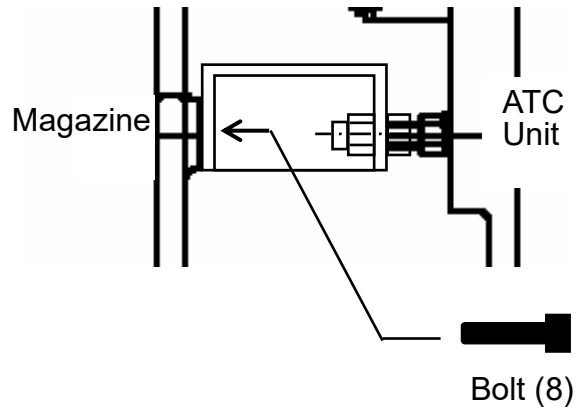
Note: Make sure that there is no clearance between the bottom of the magazine lower edge and the shoulder part of the machine bed.

O. INSTALLATION

(40/60ATC only)



9. Fix the upper part of the magazine to the machine by two bolts (8).



10. Tighten the six M16 bolts (5) finally.

Note: Make sure that there is no clearance between the bottom of the magazine lower edge and the shoulder part of the machine bed.



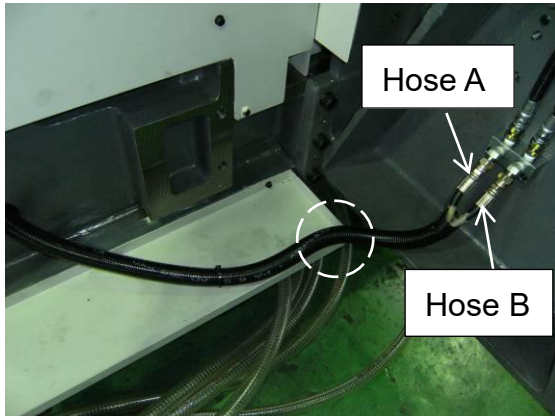
Back of Magazine

11. Introduce the black cable of the cylinder sensors from the back of the magazine to the junction box overhead, through the area at the back of the ATC unit.

O. INSTALLATION

(40/60ATC only)

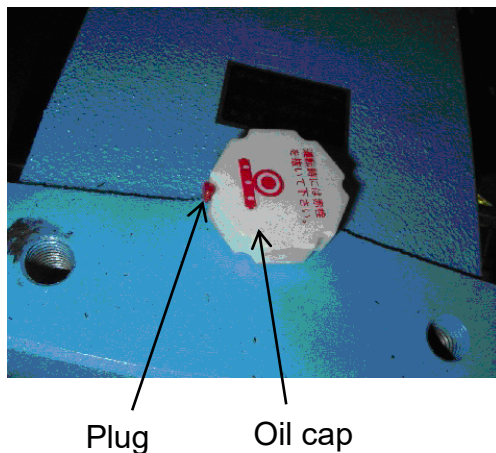
12. Connect the power/signal cables (hanging from the top of the X-axis slide cover at shipment) to the magazine servo motor.



13. Connect the hydraulic hoses for the pot sliding cylinder (coming from the hole on the side wall of the bed, near its back) to the fittings at the back of the magazine.

Note: Make sure that the hoses are protected by the flexible protector at the edge of the tray (dotted circle at left).

14. Attach Tool pot guides (2) and (3) to the magazine (see Step 3).



15. Remove the plug off the oil cap on the magazine reduction unit.

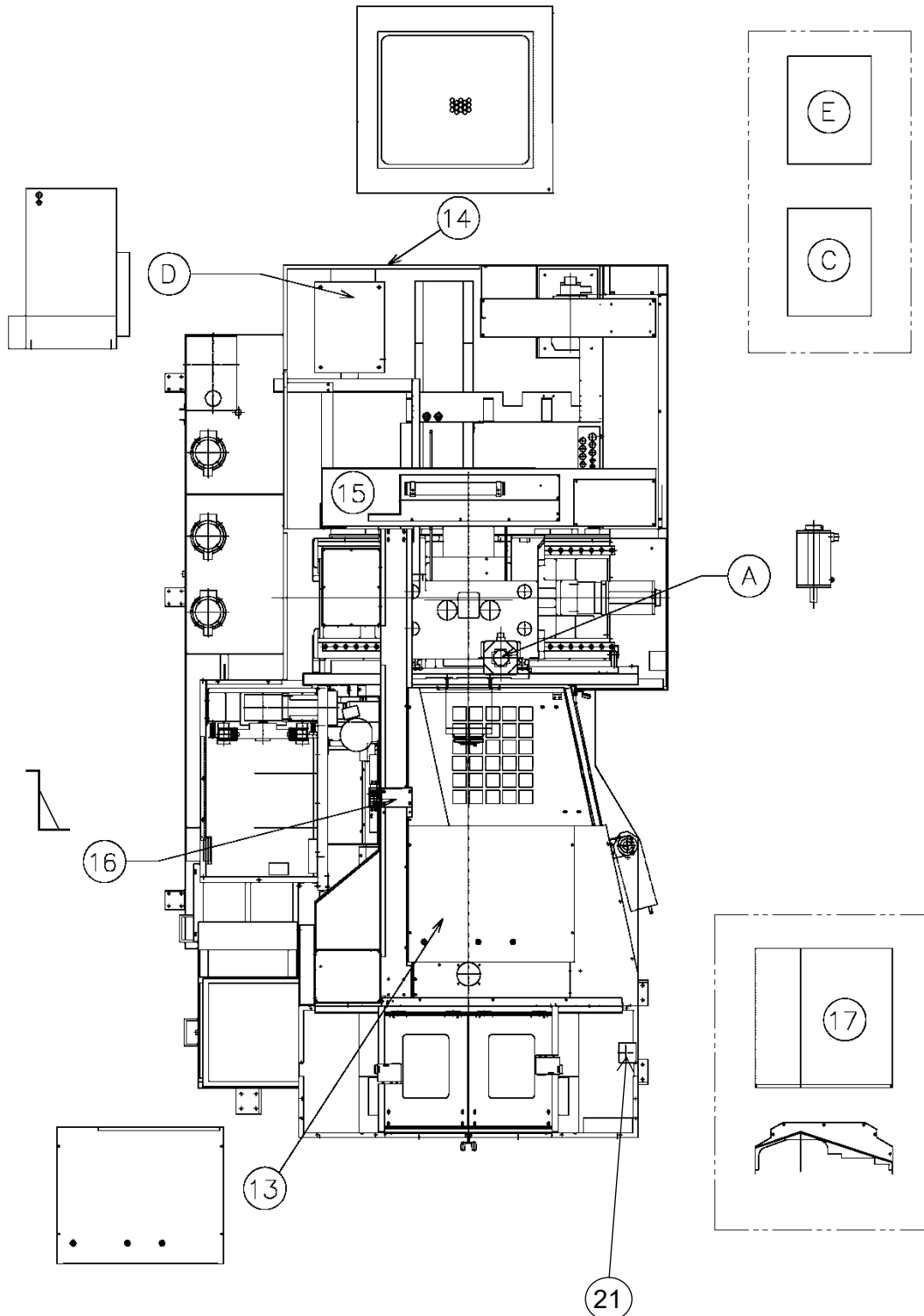
Note: Zero point setting of the magazine is necessary. After installation of the machine, please perform Zero point setting according to Section U-3 “Reset of Reference Point of ATC Magazine” in this manual.

O. INSTALLATION

O-5-2 Mounting of Parts

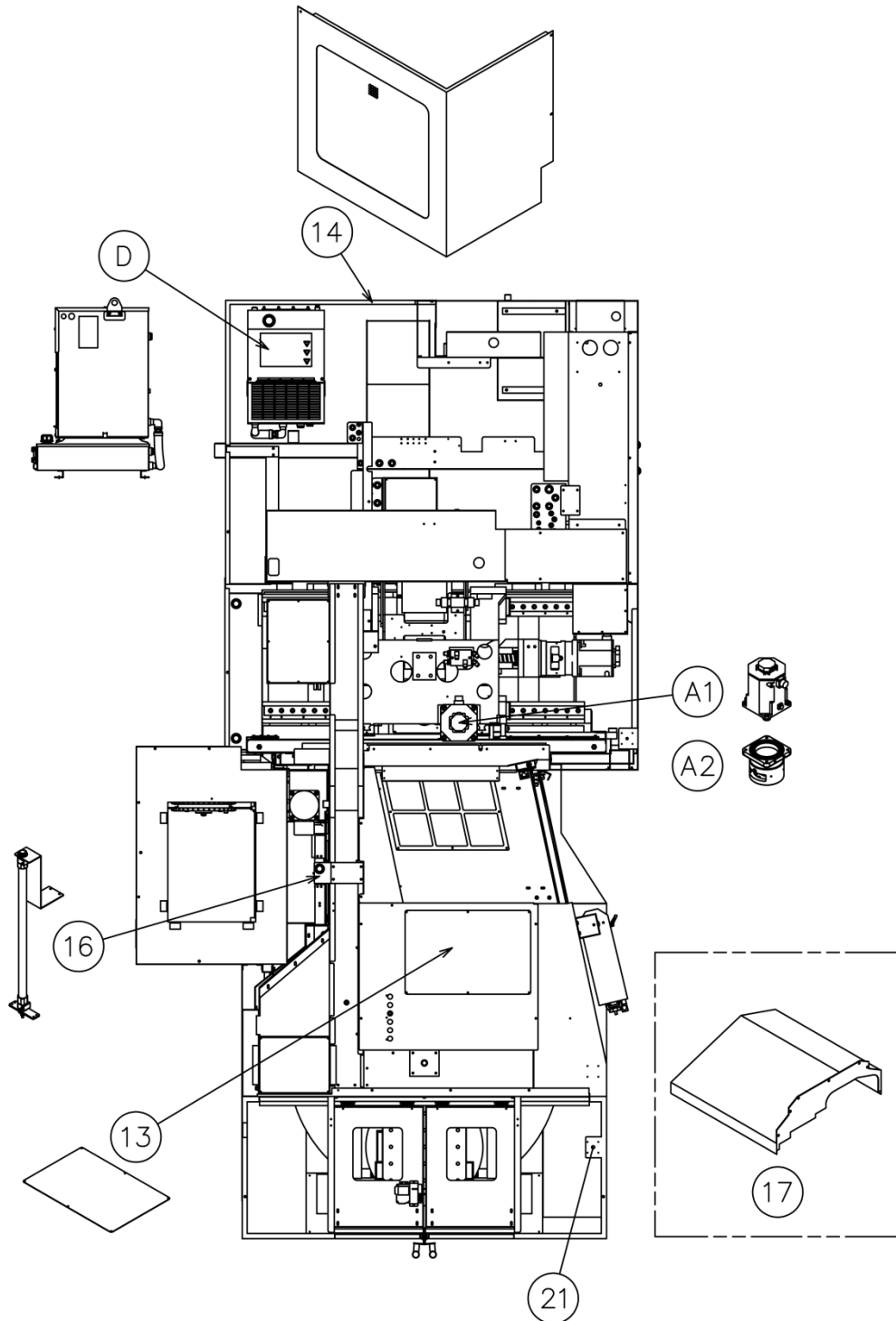
Mount the parts shown below (removed for shipment) according to the instructions on the following pages.

(Standard)



O. INSTALLATION

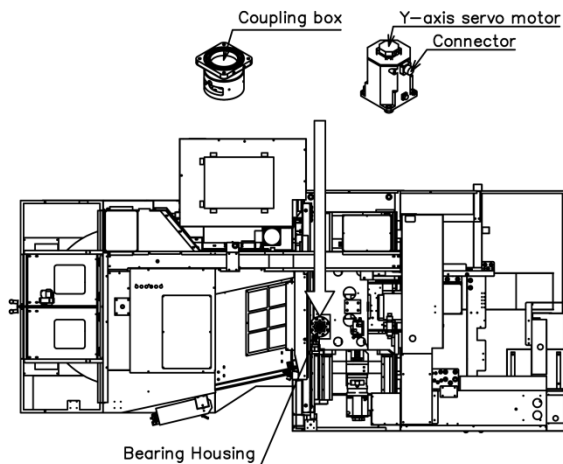
(Axis Extension)



O. INSTALLATION

Y-axis Servo Motor

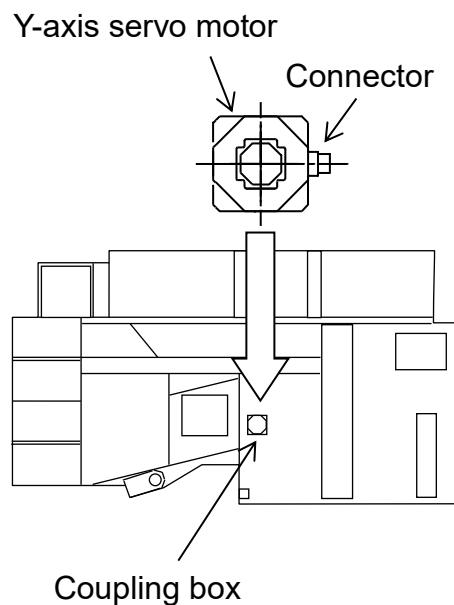
The Y-axis servo motor is removed and separately packed at shipment; the coupling is attached to the motor shaft.



Set the Y-axis coupling box on the Y-axis bearing housing.

There are two plugged tapped holes or two fittings on the flange part of the coupling box. Make sure that side of the flange comes at the rear, and connect the two hoses to these fittings if any.

(Axis Extension Only)



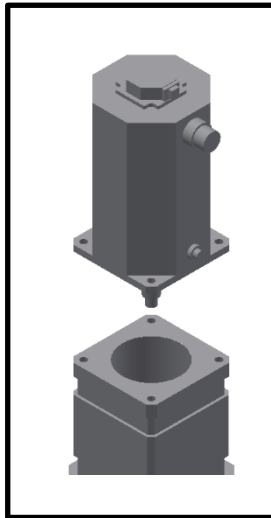
1. Set the servo motor on the Y-axis coupling box of the machine with its connector facing the rear.

(If the machine has a spindle oil chiller, oil will be circulated in the Y-axis coupling box. In this case, please check that there are two O-rings put between the servo motor and the coupling box.)

2. Fix the servo motor to the coupling box tightly with the four bolts.

O. INSTALLATION

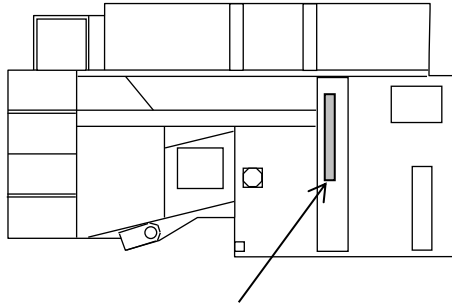
3. Fasten the coupling on the ball screw of the Y axis through the openings at the bottom of the coupling box (fastening torque : 24.8 Nm).
4. Connect the cables (Power, Signal and Brake) to the servo motor.



Note: Because the cables have been removed, the Y-axis positioning data are lost. Be sure to set the mechanical zero point on the Y axis according to Section O-5-8 “Adjustment of Mechanical Zero Point” of this chapter after turning the power on.

O. INSTALLATION

Fluorescent Light (15)

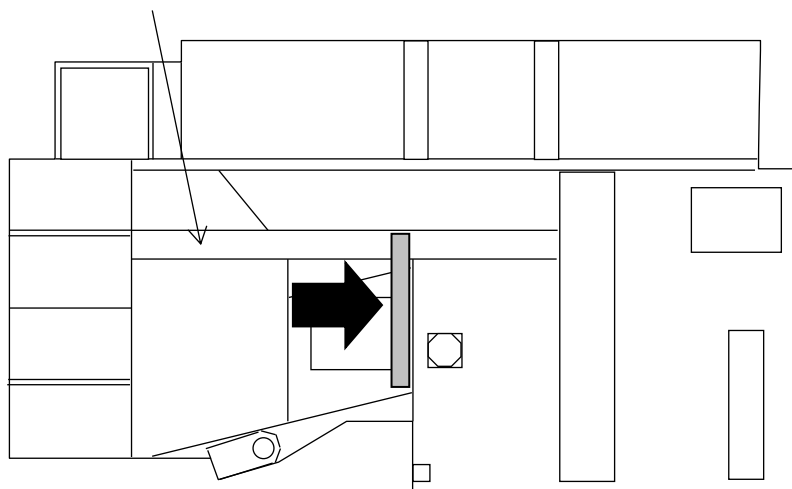


Location at shipment

The body of the fluorescent light is put on the rear part of the machine roof at shipment (but the cable is not disconnected).

Mount the plate with the fluorescent light to the beam above the X-axis slide cover of the machine (the notch of the plate meeting the ceiling duct).

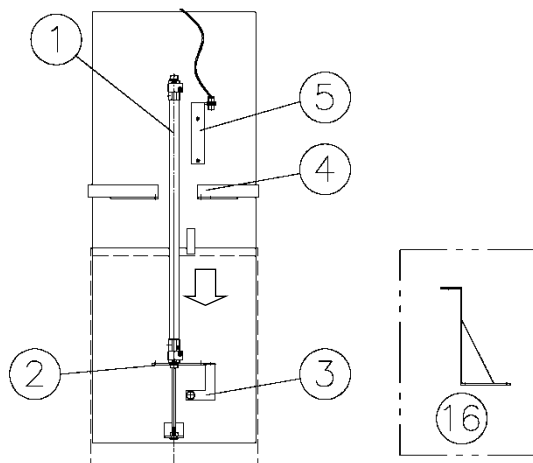
Ceiling duct



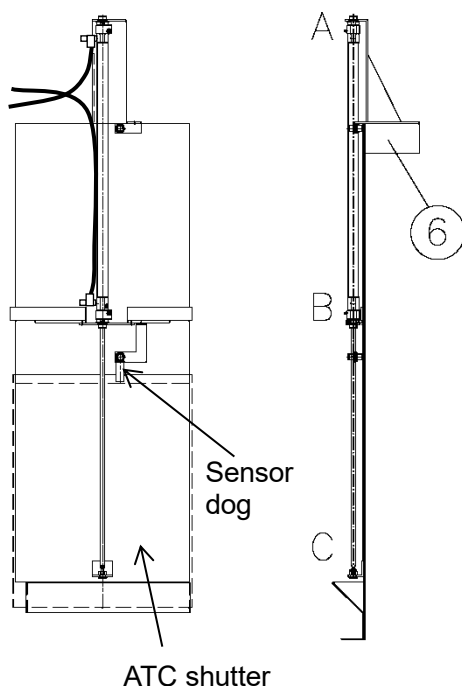
O. INSTALLATION

ATC Shutter Cylinder Bracket (16)

The ATC shutter cylinder (1), Stay (2) and Sensors (3) and (5) are removed and put around the ATC shutter at shipment.



1. Mount Upper cylinder bracket (16) on Ceiling duct (6) of the machine
2. Attach the rod end of Cylinder (1) to the ATC shutter.
3. Extend Cylinder (1) putting its upper end through the hole of Upper cylinder bracket (16), and fix Stay (2) to Bracket (4) by four bolts.



4. Fix the upper end of Cylinder (1) to Upper cylinder bracket (16) by the hexagon nut (attached to the cylinder at shipment).

Note: Pay attention to the alignment of three points A, B and C.

5. Fix Lower sensor (3) and Upper sensor (5) to the machine so that the sensor dog of the ATC shutter will come close (gap of about 1 mm) to each Sensor when the ATC shutter is opened and closed.

6. Connect the air hoses to Cylinder (1).

O. INSTALLATION

Top Cover (13)

Mount the top cover (13) for the machining area.

Connect the hoses to the nozzles on the top cover (13).

Z-axis Slide Cover (17)

Mount the Z-axis upper slide cover (17) on top of the lower slide cover, and fix it to the base of the B-axis rotary table.

Spindle Oil Chiller (D) [Option]

Put the spindle oil chiller (D) [Option] in the back of the machine and connect its hoses (no need to consider flow directions of oil) and cables.

Machine Rear Corner Covers (14)

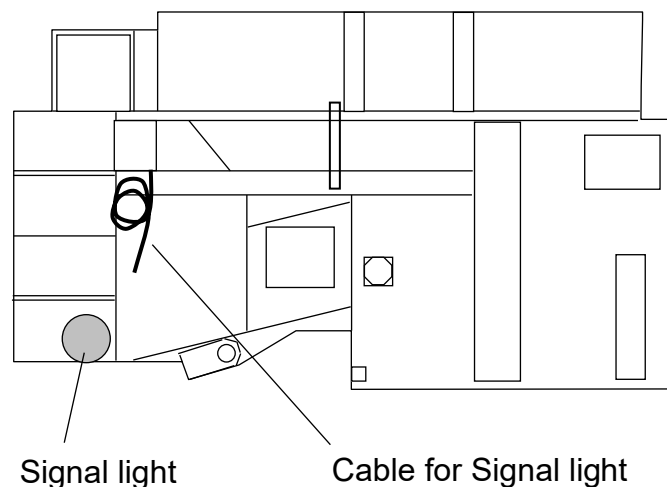
Mount the machine rear corner covers (14).

Note: Please refer to the photo on the next page.

Signal Light (21)

Mount the signal light (21) on the bracket with four bolts, and connect the cable (see below) to the signal light.

Note: Be careful of the cable; it should not be stuck when you open/close the machine front door.



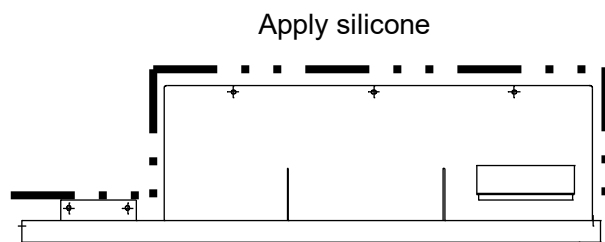
O. INSTALLATION

ATC Magazine Cover

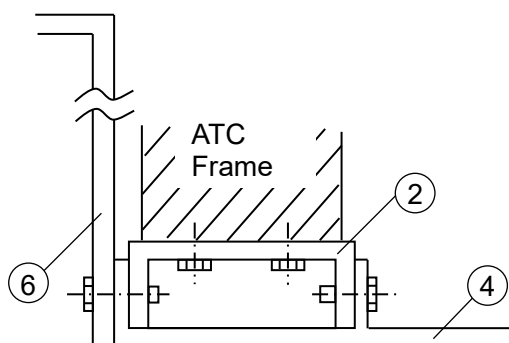
(40/60ATC)

Assemble the ATC magazine cover in the following way (refer to the drawing on the next page):

1. Attach Bottom cover (1). At this moment, apply silicone glue on the cover.



2. Attach Side covers (2) to (4).

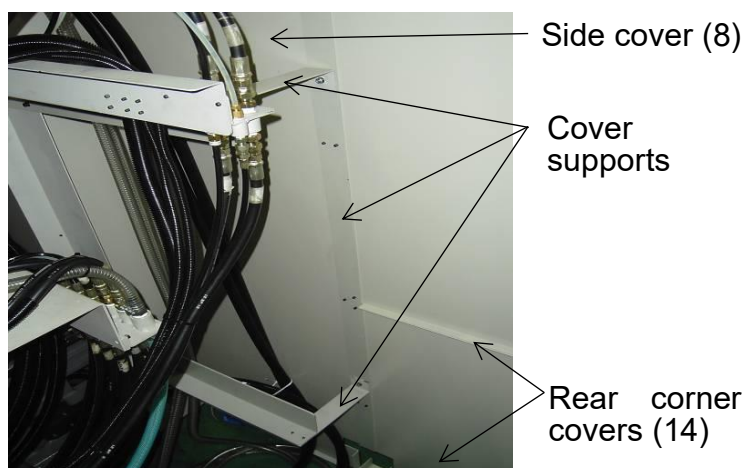


Note: This is an opening for coolant/chips to drop. Do not plug this opening.

3. Attach Magazine door (5).

4. Attach Side covers (6) to (8).

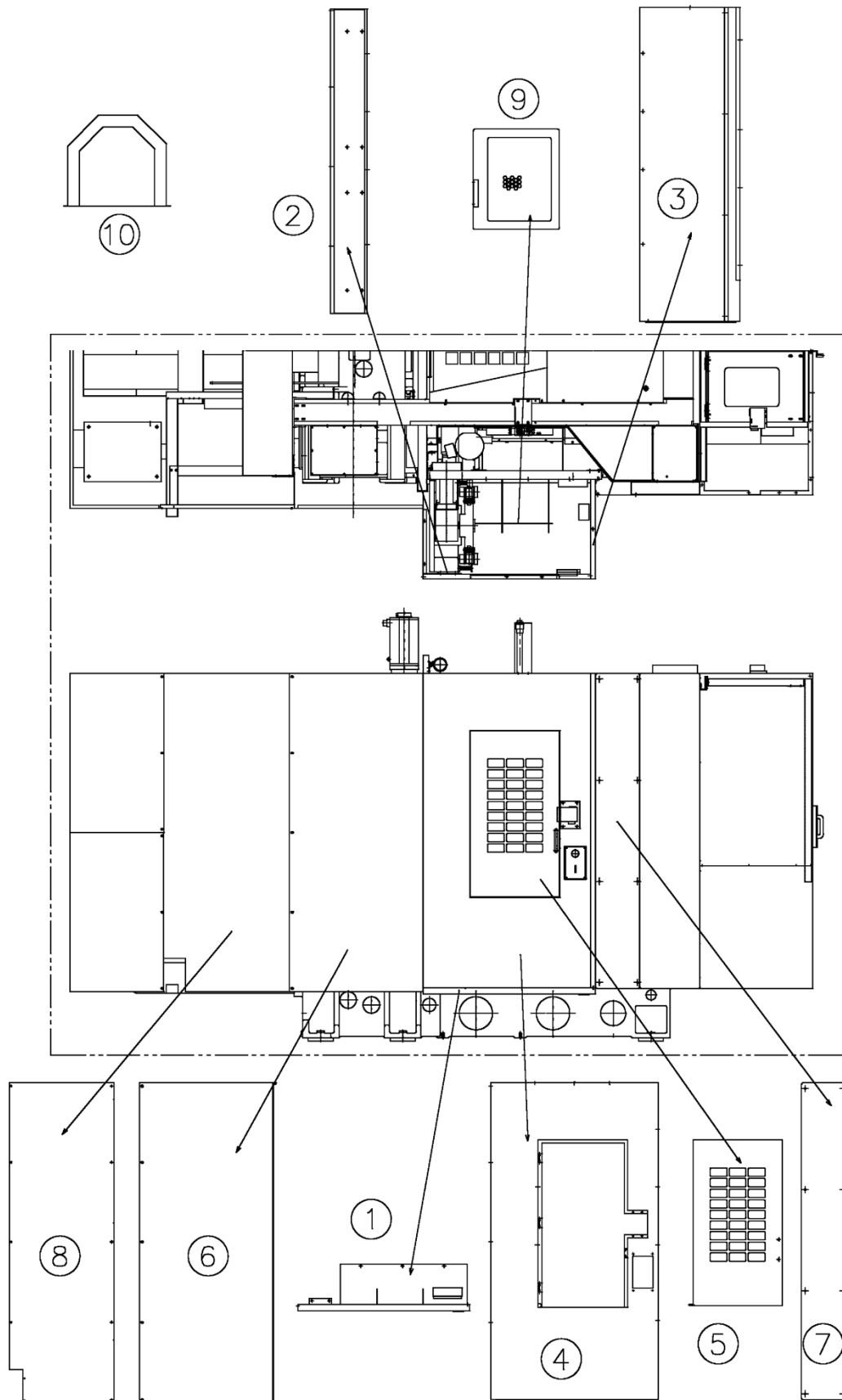
Note: Before attaching the side cover (8), attach the cover supports (removed at shipment).



5. Attach Safety cover (9) inside.

6. Attach Top cover (10) on top of the magazine.

O. INSTALLATION



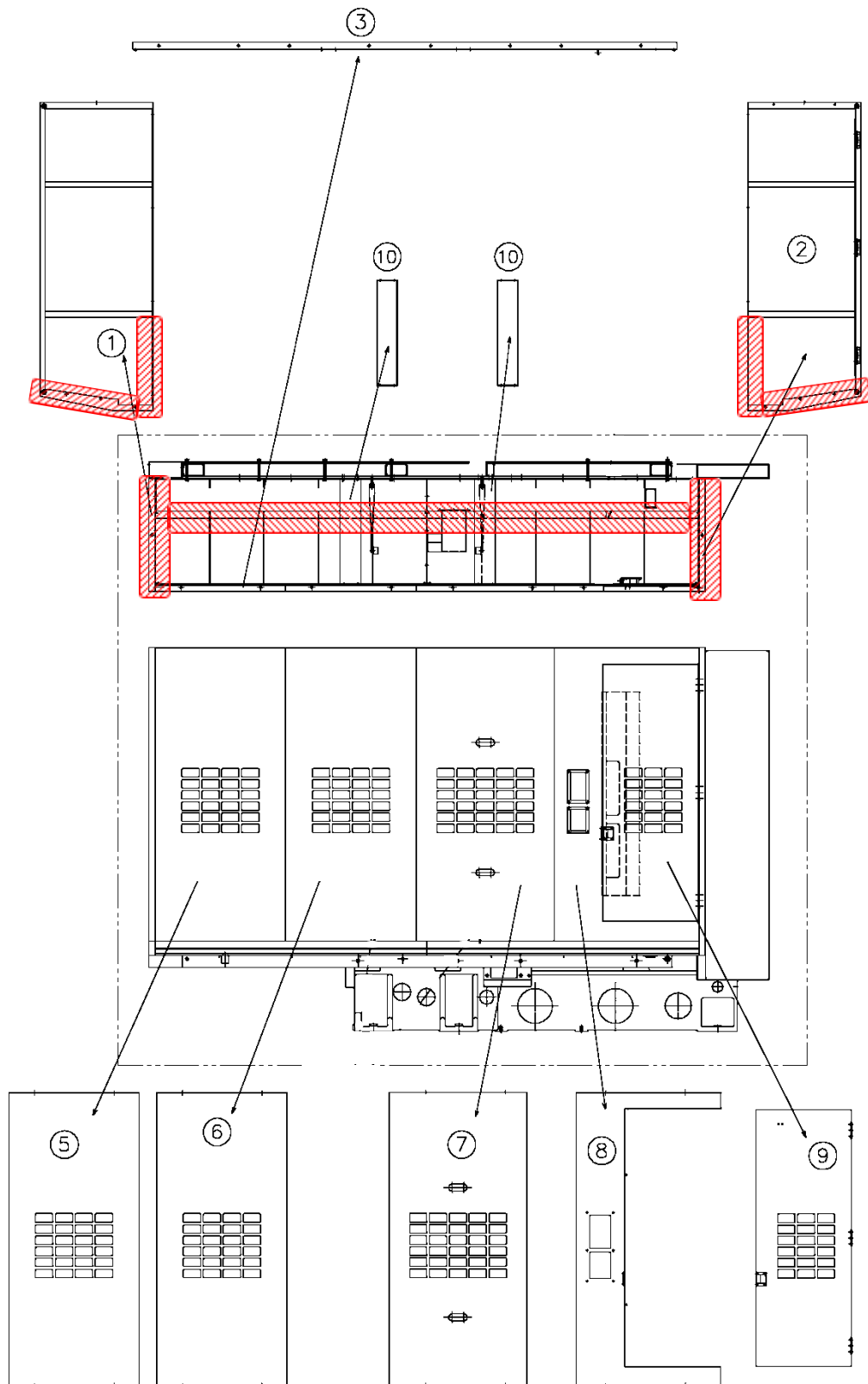
O. INSTALLATION

(80/120ATC)

Assemble the ATC magazine cover in the following way (refer to the drawing on the next page) :

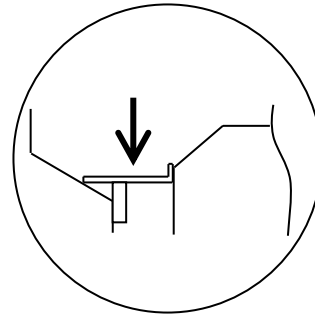
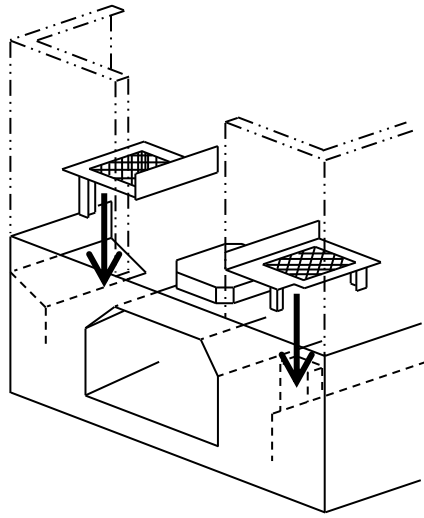
1. Unfold the magazine bottom cover.
2. Attach Side covers (1) and (2), and inserting their lower joints to the pipe of the bottom cover, fix them.
3. Apply silicone glue on the hatched areas of the bottom cover and side covers (1) and (2) as indicated on the drawing.
4. Attach Pipe (3) to the upper joints of Side covers (1) and (2) and fix it.
5. Mount Covers (5) to (8).
6. Mount Door (9) with hinges.
7. Mount two Stabilizers (10) on top.
8. Attach the ATC manual operation switches to the cover (8), and fix their cables to the magazine cover.

O. INSTALLATION



O. INSTALLATION

Safety Nets



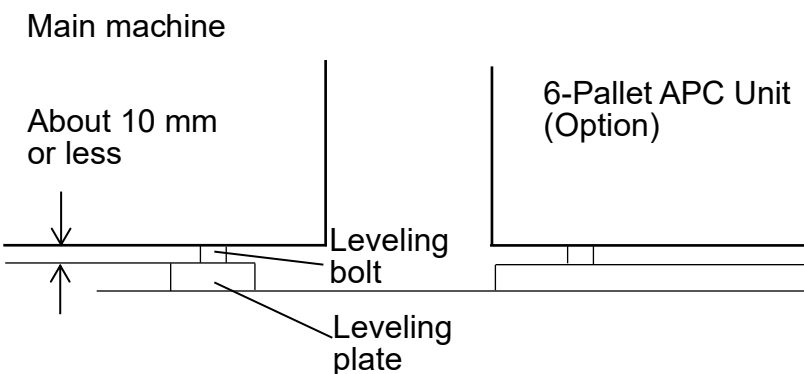
There are two nets provided for prevention of matters from falling into the coolant tank.

Put the two nets in the front of the machine.

O-5-3 Leveling of Machine

Put a level on the pallet inside the machine, and level the machine by the six leveling bolts.

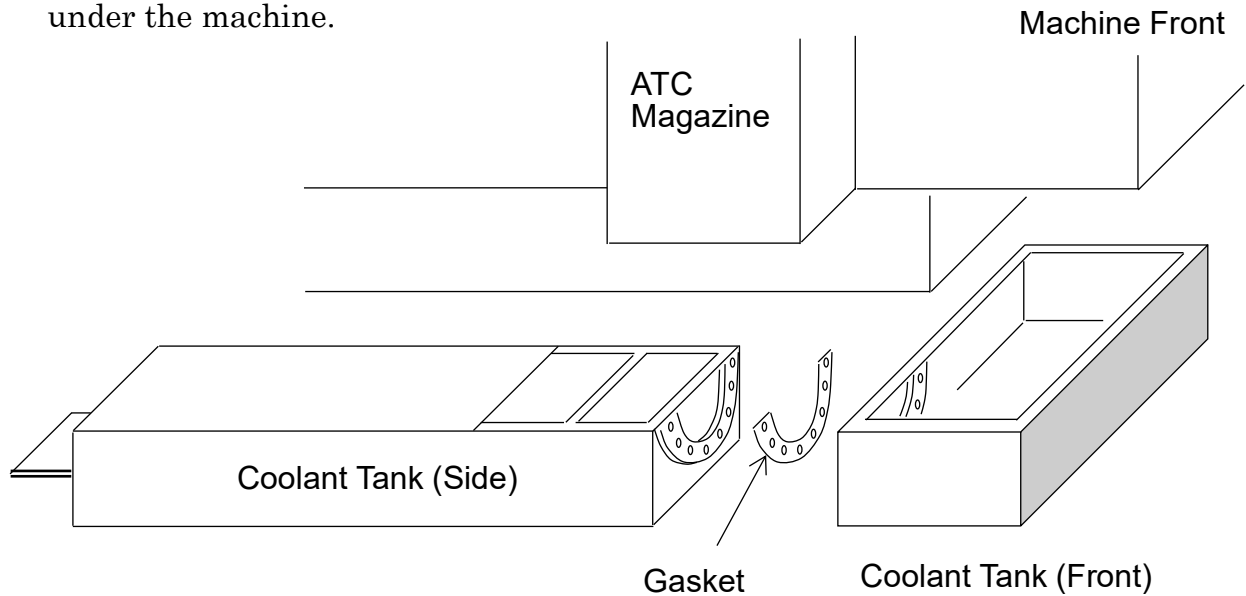
Note: If the machine is installed with a 6-Pallet APC Unit, be sure to keep the indicated dimension about 10 mm or less.



O. INSTALLATION

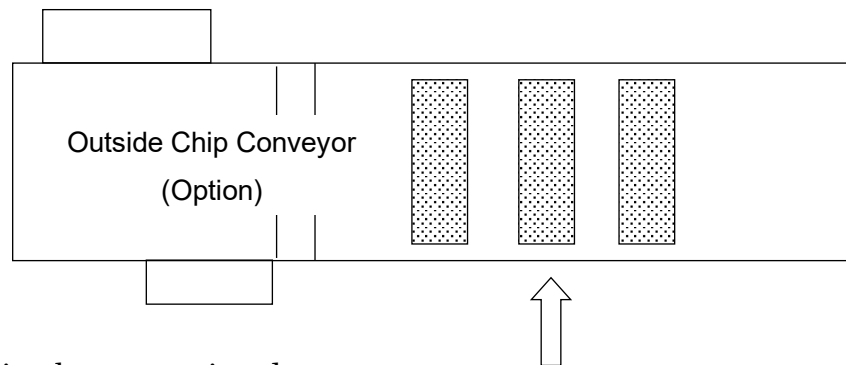
Coolant Tank

Connect Coolant tank (Front) and Coolant tank (Side) by bolts and nuts inserting Gasket between the two tanks, then put it under the machine.



Note: Check for any leak between the two tanks after filling coolant fluid.

Additional Cover for Outside Chip Conveyor



If the machine has an optional scraper type outside chip conveyor, mount the additional splash cover (supplied) on the chip conveyor. Please pay attention to the direction of the splash cover.

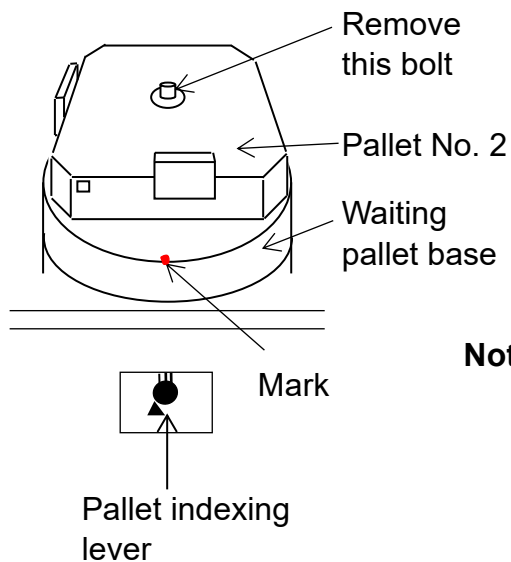


Note: This splash cover is not necessary on 6/8-pallet machines.

O. INSTALLATION

O-5-4 Pallet Setting

At shipment, the pallet No. 2 is fixed on the waiting pallet base of the setup station.



Be sure to remove the bolt at the center of the pallet before operation.

Check that the edge locators of the pallet are positioned as shown on the illustration at left, with the red mark of the waiting pallet base being in front.

Note: On this machine, the pallet numbers are not checked by identifying the pallets themselves; they are only checked by the position of the pallet changing arms. If you remove the pallets from the machine, be sure to put each pallet back to the original location.



- When you turn the pallet (400 x 400 mm) by hand, keep your hands off the protection disk of the pallet. Otherwise your fingers may be caught between the disk and pallet changing arms.
- Moreover, do not apply force on the protection disk. If the protection disk is bent, it will collide with the pallet changing arms.

O-5-5 Electric Wiring and Power Connection



- Only qualified personnel are authorized to carry out power connection and grounding work.
- To prevent other people from turning power on by mistake during connection, put a warning tag or placard such as DO NOT TURN POWER ON at a prominent place.

O. INSTALLATION

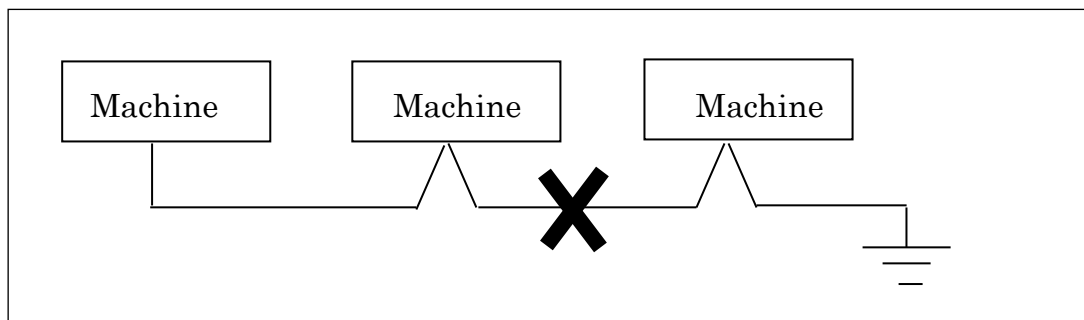
Use the following primary power source and cables.

- Power voltage
200V 3 phase (50 or 60Hz)
- Cables [from the primary power source to the main power switch of the machine]
Cable with sectional area of 22 mm² or larger recommended (50KVA).
- Transformer
If different power voltages are in service in your country, a proper transformer must be provided. Insert the transformer between the machine and the main.



WARNING

- **Use one grounding conductor to one machine. Never connect ground cables like below, or a serious accident can be caused.**



Note: After wiring, be sure to check the phase by a phase checker.

O-5-6 Air Source

Air source must be above 0.4 MPa (4 kgf/cm²), 360 N lit./min.

Make sure to use clean dry air; air containing too much dust or damp may make the machine life very short.

O. INSTALLATION

O-5-7 Fixtures for Transportation

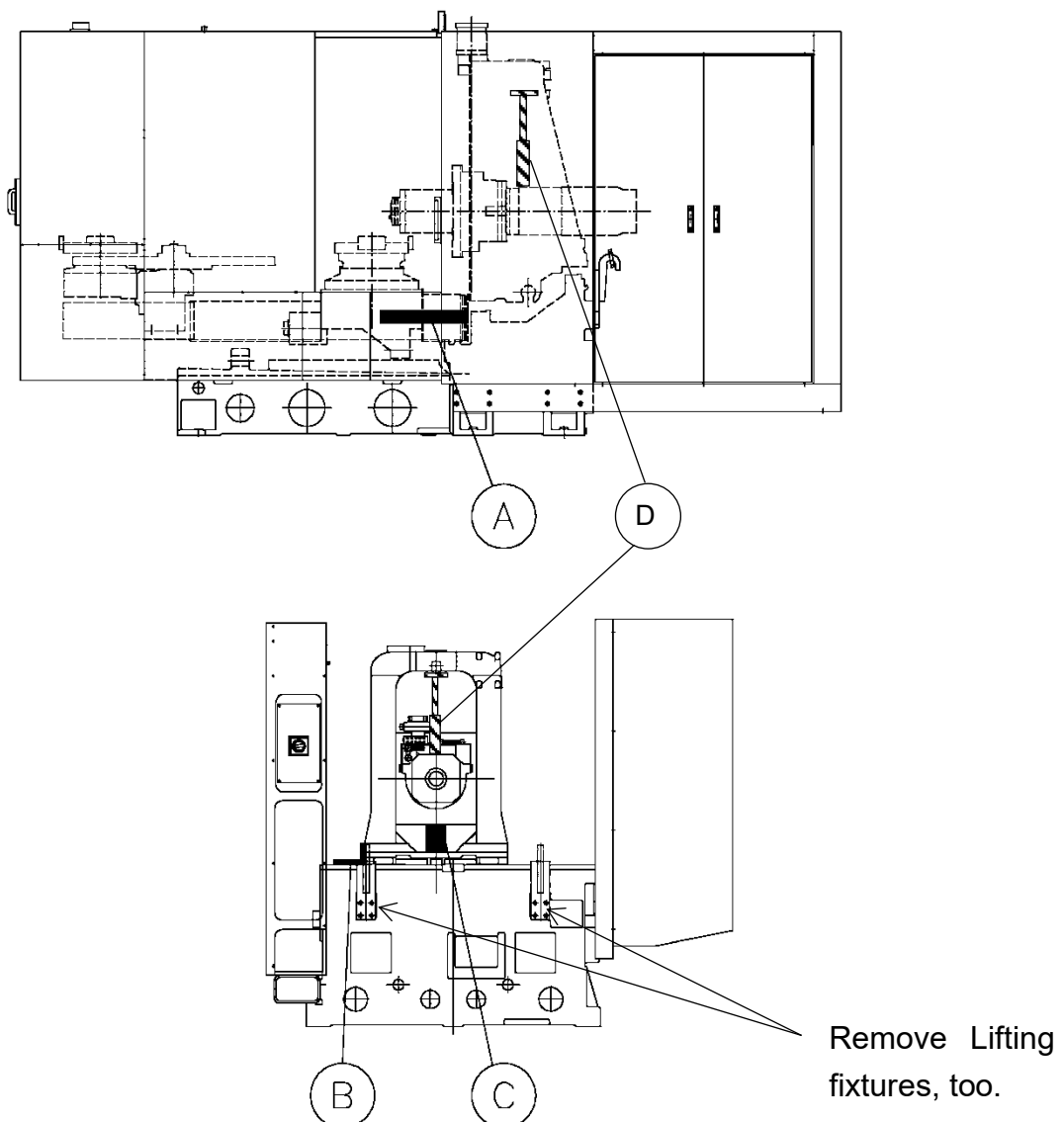
At delivery, fixtures are set for transportation.

Be sure to remove the fixtures (A) to (D) shown in the illustrations below before operation.

Note: Electric power must be turned on when removing the wooden support (C) and prop (D). Please refer to the Operation manual.

Lifting fixtures shown in Section “O-3” also should be taken off.

Please keep these fixtures for future moving.



O. INSTALLATION

O-5-8 Adjustment of Mechanical Zero Point (Y Axis)

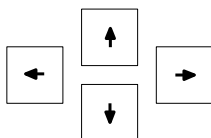
At delivery, Y-axis servo motor is taken off. After installation, adjust Y-axis Zero Point prior to operation.

Procedure

1. In MDI Mode, press [OFS/SET] key to show Setting data display. Change "PARAMETER WRITE" to "1" from "0". (Ref. U-1)
2. Press Function key [SYSTEM] and Soft key (PARAM).
3. To search Parameter No.1815, press Numerical keys [1] [8] [1] [5] and Soft key (NO SRH). The cursor moves to Parameter No.1815.
4. In order to change Parameter No.1815 Bit 4 to "0" from "1", press the cursor keys to move cursor at APZ of Line Y. Press Numerical key [0] and then [INPUT] key.

SYSTEM

1 8 1 5



O INPUT

PARAMETER (SETTING)					O0000 N0000		
1815	APC APZ						
X	0	0	1	1	0	0	0
Y	0	0	1	1	0	0	0
Z	0	0	1	1	0	0	0

Change this "1" to "0".

P/S Alarm message "Please turn off power." appears.

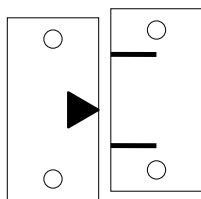
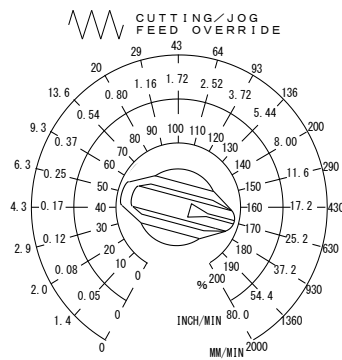
O. INSTALLATION

5. Press [OFS/SET] key to display Setting data screen. Change "PARAMETER WRITE = 0". (Ref. U-1)

Press [RESET] key.

6. Press Emergency Stop pushbutton (61) and NC OFF pushbutton (57) to turn NC power off once. By this procedure, the NC deletes the Y-axis mechanical zero point.

Press NC ON pushbutton (56) to power on NC. Alarm NO.300 [APC Alarm Y axis origin return] occurs. Release Emergency Stop pushbutton (61) and press NC Ready pushbutton (58). Now NC is ready for operation.



7. In JOG mode, set Feed Rate Override and JOG Feed Setting switch (69) at 630mm/min.

8. Press Y-axis Selection pushbutton (26).

9. Press Plus Direction Feed pushbutton (78) until the pointer of the Zero Point plate on the spindle head side gets between the 2 lines of the Zero Point plate on the column side.

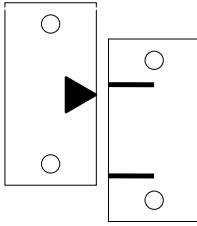
Note: Perform axis traverse in plus direction.

10. Perform Zero point return on Y-axis as below.

Zero Point Return (Y-axis)

Confirm that Y-axis is selected. Press Zero Point Return Mode pushbutton (8), and keep pressing Plus Direction Feed pushbutton (78) until Y axis Zero Point Return completion lamp is lit.

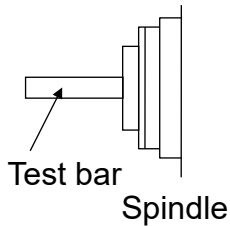
O. INSTALLATION



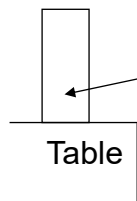
The pointer comes nearly at the upper line of the Zero Point plate on the column side.

Note: Confirm that the Y-axis Zero Point Return Completion lamp (22) is lit.

11. Now temporary Zero Point (Y-axis) is got. From now on, it's necessary to get true Zero Point.



Put Test bar of any diameter onto the spindle. (Here we take Test bar of Dia. 50 mm.) Put Block gauge of any height on the table (Here we take Block gauge of 100 mm high).



12. The amount and direction to move is calculated as below:

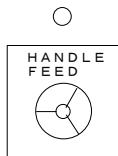
$$Y = (25 + 100) - 660 = - 535$$

(25: Test bar radius, 100: Block gauge height, 660: Y-axis height)

(In case of Axis Extension)

$$Y = (25 + 100) - 790 = - 665$$

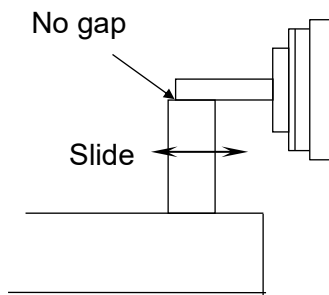
(25: Test bar radius, 100: Block gauge height, 790: Y-axis height with extension)



13. Put Block gauge aside off the test bar. In Handle mode, move Y axis by 535 (in case of Axis Extension: 665) mm in minus direction.

14. Press Soft key (REL) in Position screen. Press Y axis Selection pushbutton (26) then press Soft key (ORIGIN) so that the Y-axis coordinate is set "Y 0.000".

O. INSTALLATION

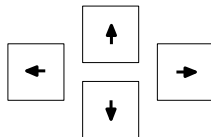


15. With Manual Pulse Generator (Handle feed amount should be $\times 10/0.01\text{mm}$), move Y-axis and find the point where Block gauge slides under the Test bar without gap.

16. Check the relative coordinate. Multiply the data shown as Y-axis coordinate by 1000. Here we suppose "Y 1.010" as the relative coordinate. The amount to be input should be 1010 (1.010×1000).

17. In MDI mode, press [OFS/SET]. Change PARAMETER WRITE to "1 (ENABLE)" (Ref. U-1)
PS/100 Alarm is displayed.

18. Press [SYSTEM] → [PRM] → [1850], (NO SRH) in this order. The Cursor goes to No.1850.



19. Move the cursor to Y-axis.

20. Press [1], [0], [1], [0] and Soft key (+INPUT). The original value at Parameter No.1850 Y-axis changes to the value added 1010 to the original value.

Note: Parameter No.1850 is for "Grid Shift".

The machine Zero Point is shifted by the amount input here. The input value should be the measured data multiplied by 1000.

Usually, the shift amount should be around +/- 10 mm.

O. INSTALLATION

ex.)

Here for example, suppose the original data for Y-axis is “3210”. With cursor keys, move the cursor to Y-axis.

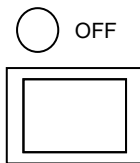
PARAMETER (SETTING)	O0000 N0000
1850	
X	335
Y	3210
Z	-4691

Input “1010” then press Soft key (+ INPUT).
The Y axis data changes to the value added by 1010, that is, “4220”.

PS/000 Alarm appears requesting power off.

21. Press [OFS/SET] key.

22. Change Parameter Write to “0 (DISABLE)”.
Press RESET key.

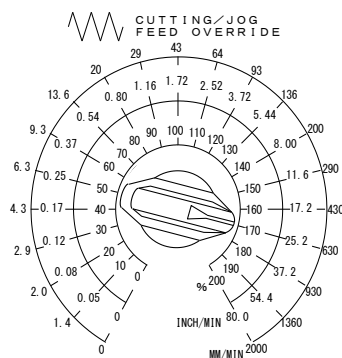


23. Press NC OFF pushbutton **(57)**, to turn power off once.

24. After a few seconds, bring machine in ready status.

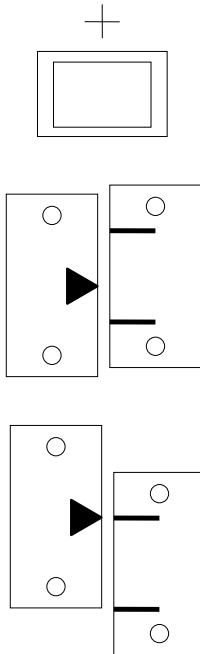
PS/300 Alarm is displayed.

25. In JOG mode, set Feed Rate Override and JOG Feed Setting switch **(69)** at 630mm/min. on the outer scale.



O. INSTALLATION

26. Confirm that the Y axis is selected.



27. Keep pressing Plus Direction Feed pushbutton (78) until the pointer of the Zero Point plate comes around the center of 2 lines of the other Zero Point plate.

28. Perform Zero Point Return on Y-axis in Zero Point Return mode. (Ref. Step 10)

When Y-axis Zero Point Return Completion lamp (22) is lit, check that the machine coordinate of Y-axis is "0R. Also check that the pointer of Zero Point plate is right at the upper line of the other Zero Point plate.

29. For confirmation, check that the Z-axis has the height of 660 (in case of Axis Extension: 790) mm.

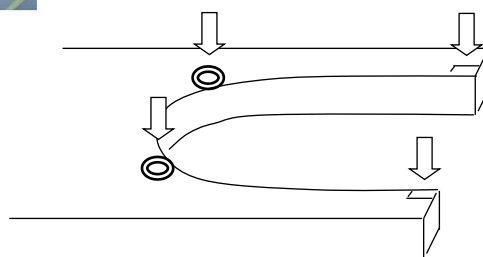
Note: When it doesn't have the correct height, try it again from Step 13.

O. INSTALLATION

Coolant Shower on Pallet Changing Arms



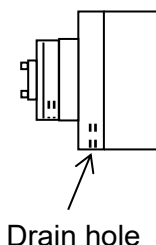
Please check and make sure that coolant from the ceiling nozzles (see the photo at left) is applied on the pallet changing arms to wash the spots indicated by the arrows below. (Some nozzles are pointed at part of the operator door and so on.)



Pallet changing arms

PLEASE READ BEFORE ROTATING THE SPINDLE!

The spindle bearings are lubricated by the oil and air lubrication system together with the ballscrews and linear guides. When you rotate the spindle for the first time after installation, please be sure to follow the steps below:



- 1) After turning power on, put a light tool into the spindle, and press Oil & Air pushbutton on the operation panel to check that small particles of oil are flowing out of the mixing valves (refer to Chapter "R" of this manual).
- 2) Keep the machine in NC ready status until drops of oil come out of the drain hole at the lower part of the spindle nose. It may take about an hour, but pressing Oil & Air pushbutton from time to time will shorten the time.
DO NOT ROTATE SPINDLE BEFORE OIL COMES OUT!
- 3) Rotate the spindle under $1,000 \text{ min}^{-1}$ for more than 20 minutes.
- 4) Perform a spindle warm-up operation.

P. LUBRICATION

P. LUBRICATION

Lubrication is an important factor to ensure a long life and the best performance of the machine. The following attention should be paid for that purpose:

1. Use a specified amount of designated oil. If non-designated oil is used or an excessive quantity is supplied, it may cause trouble.
2. Before supplying oil, clean up oil supply inlet of lubrication pump and so on. It can prevent dust from coming in.
3. Pour oil through a filter to remove dust and other foreign objects from the oil. If a filter is not available, use a wire net finer than 150 meshes.
4. New oil should be used each time. Never mix regenerated or used oil with new one.
5. Even if oil is poured from a newly opened can, do not use all of it. There may be some impurities and water at the bottom of the can.

Note: Oily coolant has been used for test of Spindle through coolant system (option) of the machine at Kiwa before shipment. So some of the oily coolant may remain in the system including hoses, filter, etc. Please separate it when you circulate coolant for the first time.

P. LUBRICATION

P-1 Lubrication Points

No.	Lubrication Point	Amount	Frequency	ESSO	Mobil	Shell
1	Coolant Tank	550 lit.	As needed			
2	Spindle oil cooler (12,000/15,000 min ⁻¹)	15 lit.	Exchange every 6 months	Unipower MP10	Velocite Oil No.6	Shell Tetra Oil 10SP
	Spindle oil cooler (20,000 min ⁻¹)	30 lit.				
3	ATC Unit*	8.0 lit. (See next Page.)	Exchange every 2 years	Esso Gear Oil GX 80W-90	Mobilube HD 80W-90, Mobilube 1 SHC 75W-90 or Mobil Delvac 1 Gear Oil 75W-90	Shell Gelco Power Gear 80W-90
4	Magazine Rotation Chain	A few drops	Monthly	Unipower MP68	Vactra Oil No.2	Shell- tonna Oil S3M68
5	Axes and Spindle Lubrication Unit	1.8 lit.	As needed	Teresso 32	DTE Oil Light	Shell Tetra 32
6 **	Rotary Table RTH-423 (66.6min ⁻¹)	8.0 lit.	Exchange every 6 months		Mobilube 1 SHC 75W-90 or Mobil Delvac 1 Gear Oil 75W-90	
	Rotary Table RTH-425 (33.3min ⁻¹)	6.0 lit	Exchange every 6 months	Spartan EP100	Mobil Gear 627	Shell Omala S2G100
7	Hydraulic Unit	20 lit.	Exchange every 6 months	Unipower SQ32	DTE 24	Shell Tellus S2M32
8	ATC Tool Pot Support (80/120ATC)		Monthly	Unipower MP68	Vactra Oil No.2	Shell- tonna Oil S3M68
9	ATC Magazine Reduction Unit (40/60ATC)	1.0 lit.	No need to replace	Spartan EP260	Mobil Gear SHC-260	Shell- Omala S4WE260

N O T I C E

Be sure to use the lubricants specified above. If lubricants not specified in the table are used, there will be no warranty for any trouble.

Note *: Please replace the oil in the ATC unit after the first one month (if tools are changed frequently such as 30 times an hour with 2-3 shifts a day) or two (if less frequent) of operation.

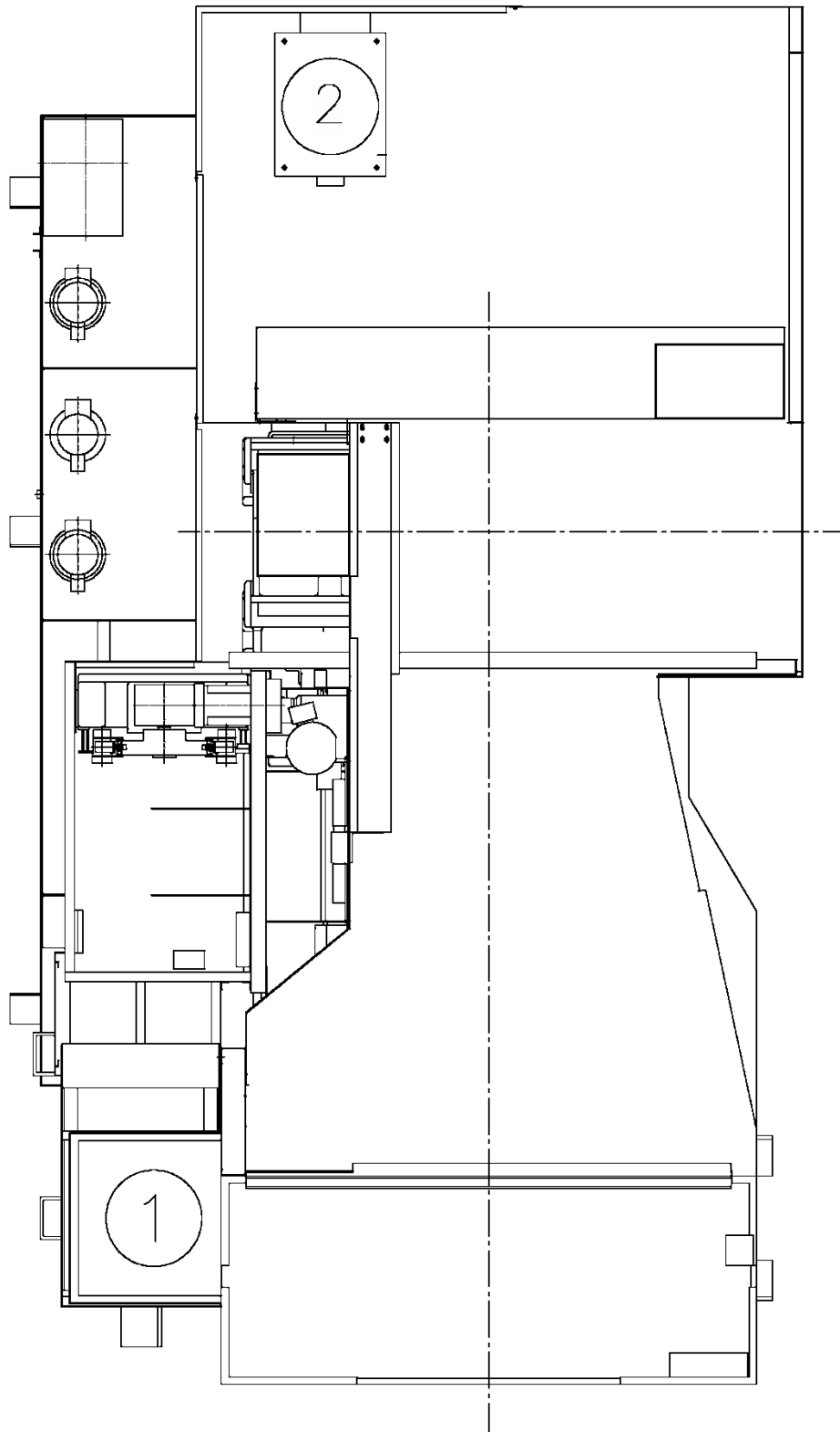
Note **: Make sure to check the model of the rotary table and use the correct oil.

Note 1: The amount of oil in each component should be checked daily if applicable.

Note 2: When replacing oil of Spindle oil cooler, ATC unit, Rotary table or Hydraulic unit, all the amount should be exchanged at once. Do not add oil to the older oil to prevent mixture of oil from different makers.

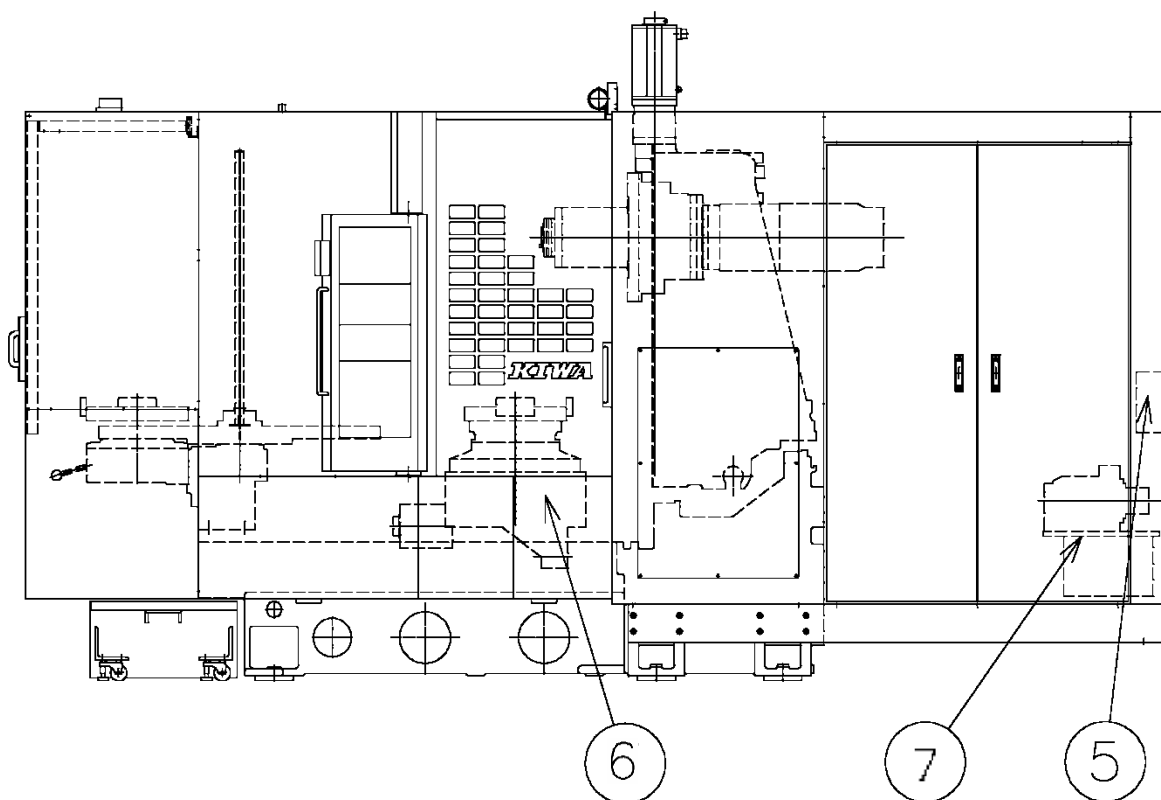
P. LUBRICATION

Lubrication Point 1



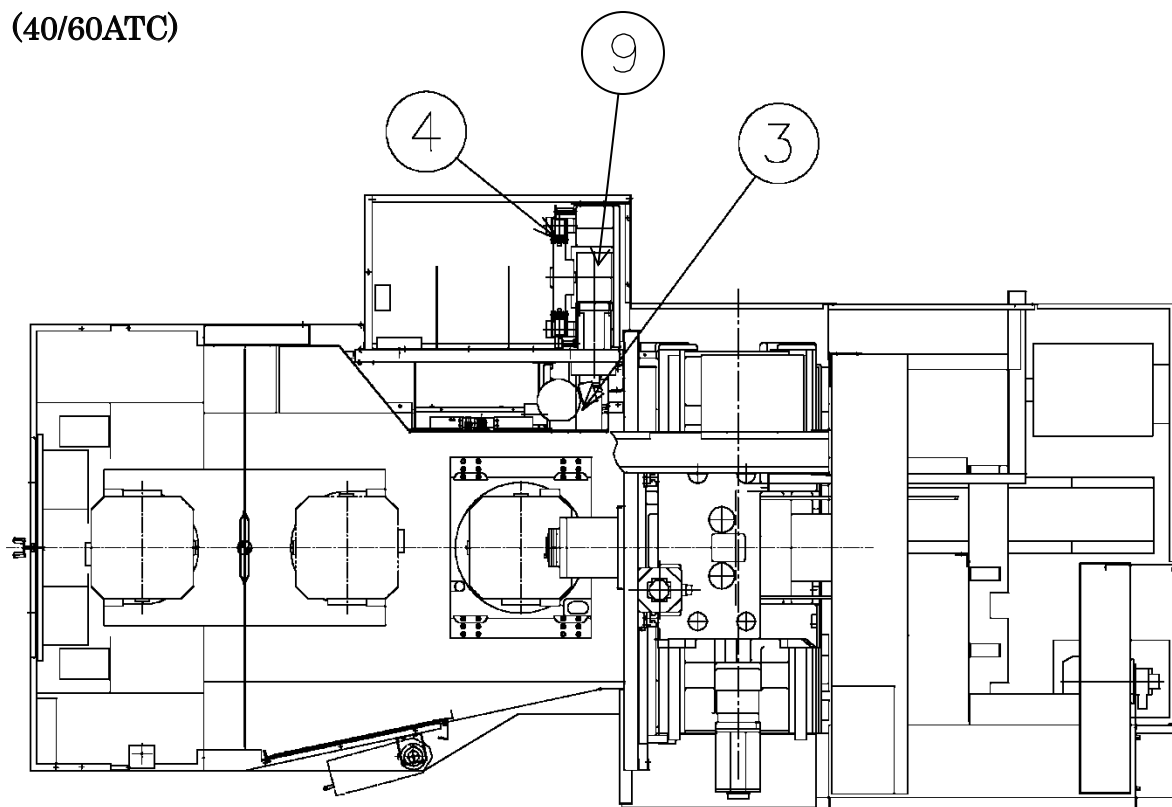
P. LUBRICATION

Lubrication Point 2

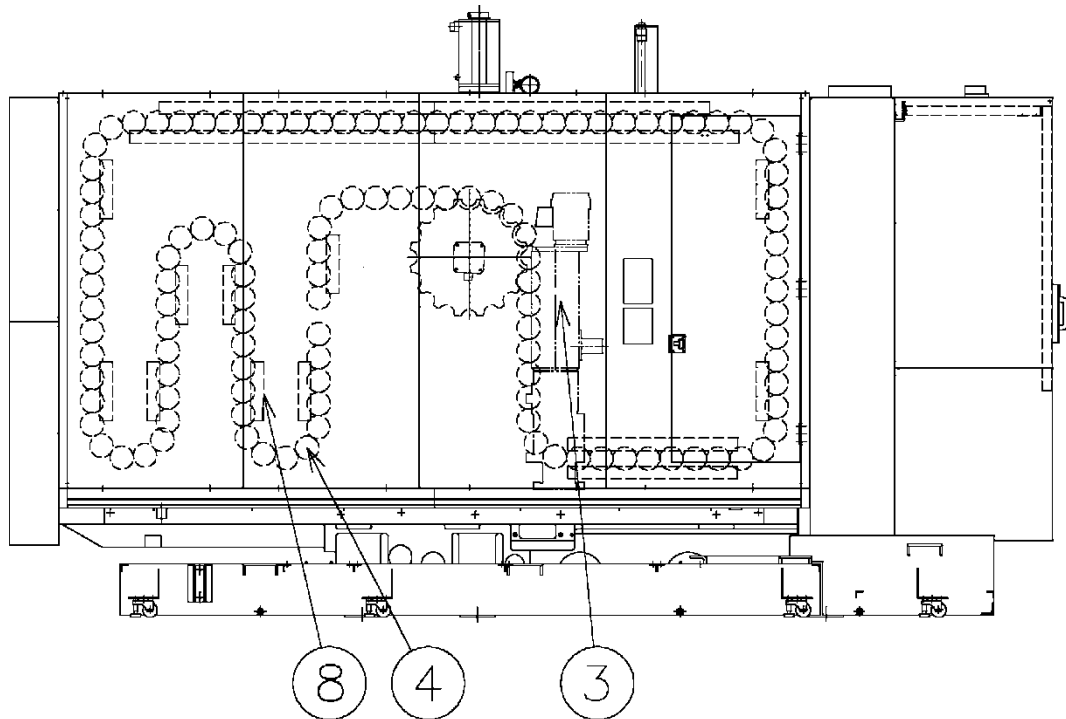


P. LUBRICATION

(40/60ATC)



(80/120ATC)



P. LUBRICATION

P-2 Replacement of Oil

The oil replacement timing is specified in the lubrication points table. Refer to the table and replace the oil when the replacement time comes.



DANGER

When adding or replacing oil to any unit, please make sure to turn off the power supply before working.

Lubrication and Replacement of Oil in ATC Unit

Oil Replacement Procedure

1. Prepare a container to collect the dirty oil and put it under the drain port. After that remove the drain plug.
2. After collecting all the oil, wind a new seal tape around the drain plug you removed earlier and attach the plug to the drain port.
3. Remove the cap of the oil filling port. While confirming the oil gauge, fill new oil until it reaches the red circle level at the center of the gauge.
4. After filling the oil, attach the seal tape around the removed plug. Insert the plug into the oil filling port.

Lubrication of ATC unit

Check the oil gauge daily. And fill new oil when the oil level in the oil gauge disappears. To add oil, refer to the above procedure 3 to 4.

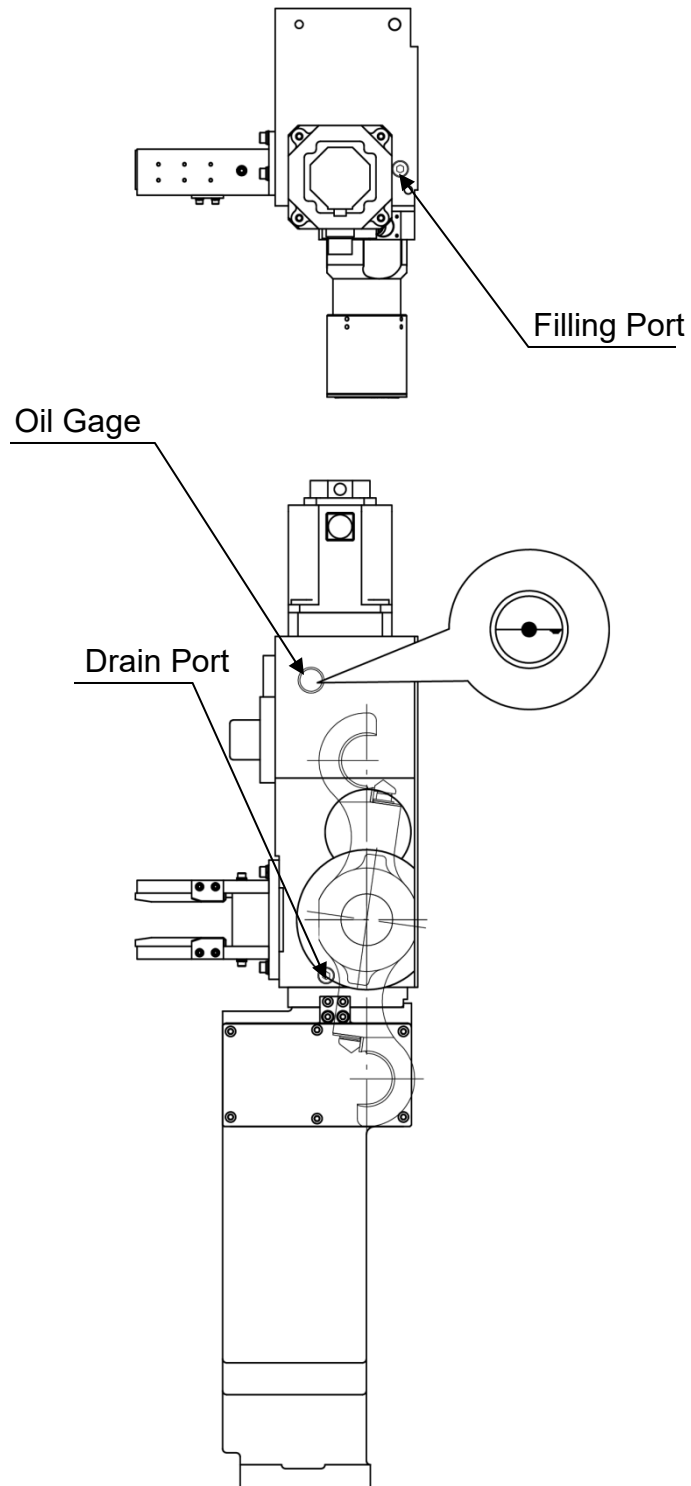
Refer to the figure on the next page for the position of the oil gauge, etc...



WARNING

Since the lubrication position is at a high place, please use a stable ladder or stand and work carefully for your safety.

P. LUBRICATION



[Left side ATC unit]

P. LUBRICATION

P-3 Coolant Tank

1) Cleaning of the filter

The coolant tank is separated from the machine.

The filter in the coolant tank becomes clogged in use.

The clogged filter deteriorates coolant oil and it can generate trouble on coolant pumps.

Check the coolant tank daily and clean the filters.



Turn main power off before cleaning or replacing filters.

Before cleaning filters in the coolant tanks, turn off the switch of the pumps and wait until the coolant stops flowing.

Procedure

(See the next page)

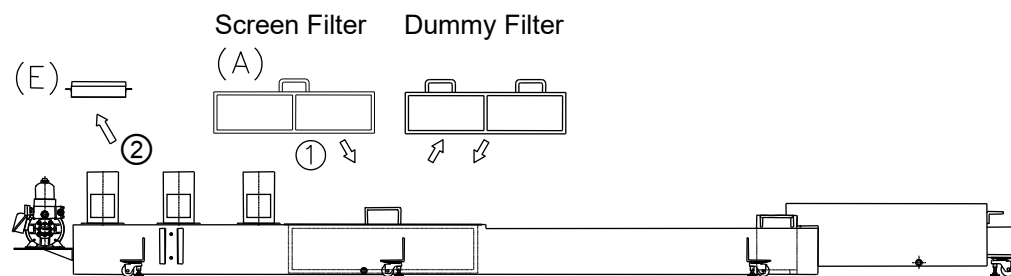
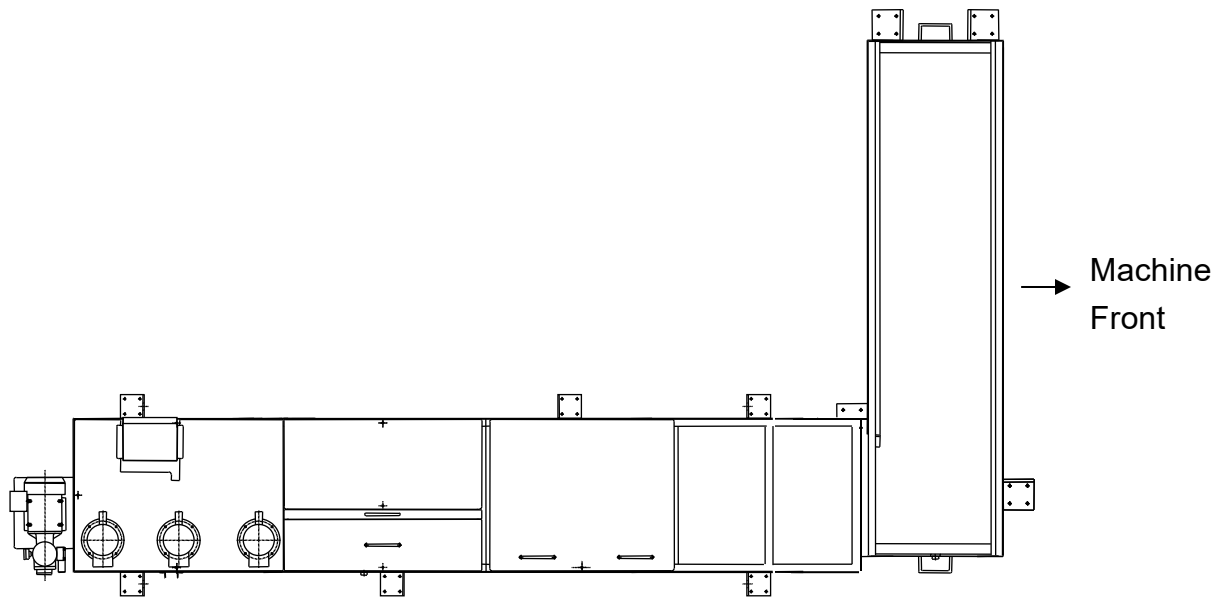
(1) Replace the screen filter (A).

Note: There is a dummy filter set behind the screen filter.

Be sure to refer to Section Q-8 “How to Replace Screen Filters”.

(2) Clean the bucket (E).

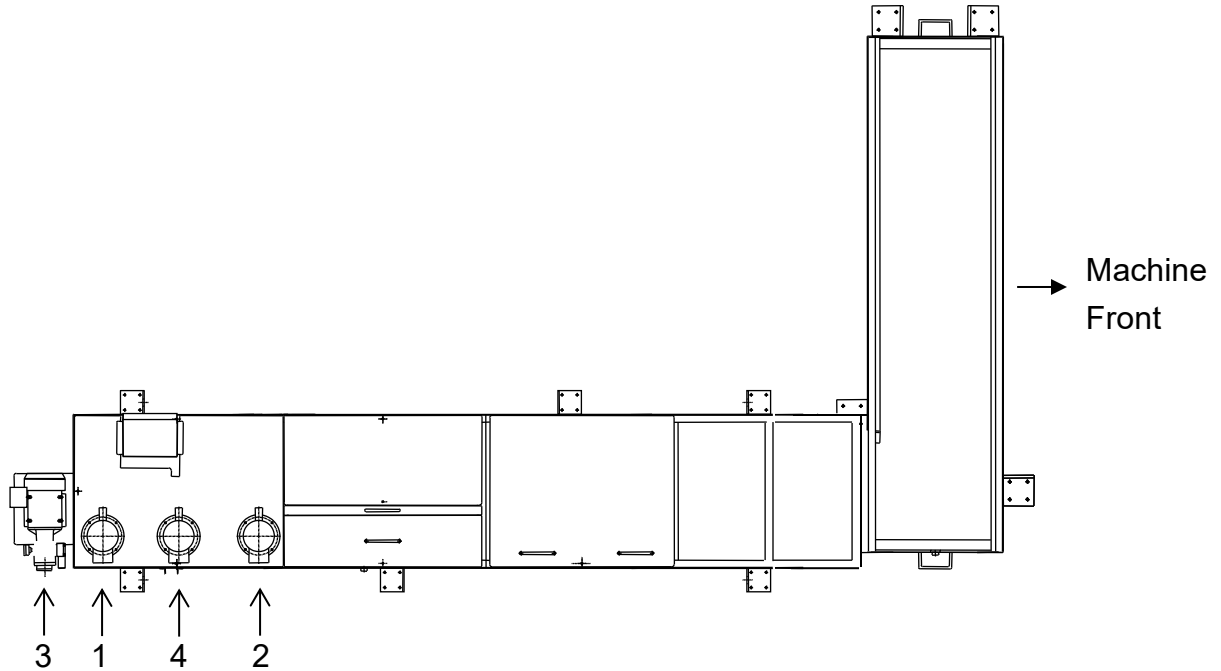
P. LUBRICATION



Coolant Tank

P. LUBRICATION

2) Coolant pumps



	Pump	Connection	Hose
1	for 1st coolant	from the spindle	3/4"
2	for 2nd coolant	from the APC	1"
3	for 3rd coolant (option)	from the through spindle coolant system	1/2"
4	for 4th coolant	from the bed	1"x 2 pcs

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Periodical check-ups are indispensable for good maintenance of the machine, keeping it in good working condition and extending its service life.



DANGER

- To prevent other people from turning power on or touching the operation panel by mistake during maintenance or servicing, place a tag or placard showing that maintenance is under way at a prominent place.
- Before maintenance or servicing, turn off the main power breaker. For maintenance in the electric box, in particular, shut off the primary power of the factory, and do not open the electric box doors for several minutes after that because residual high voltage is still present. Failure to observe this warning may result in serious personal injury or even death from electric shock.

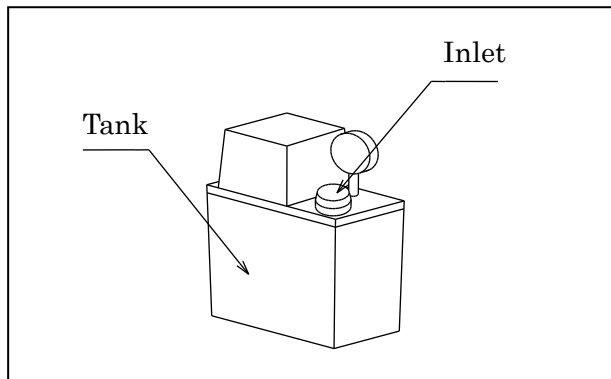
Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Q-1 Lubrication Unit

Lubrication unit for Spindle, Ballscrews and Linear guide

1. Lubrication

Be sure to use specified new oil only.



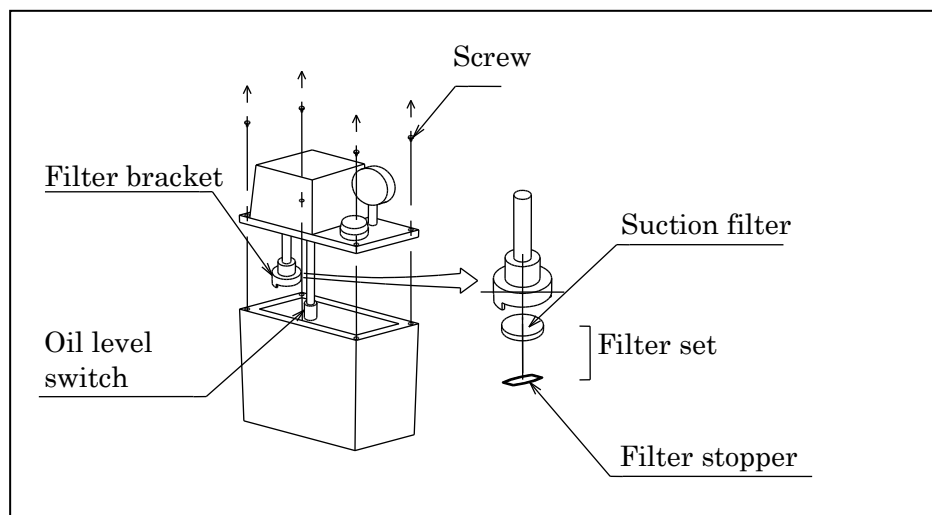
Specified Oil

MAKER	TYPE
Esso	Teresso 32
Mobil	DTE Oil Light
Shell	Shell Tetra 32

AMZ-III
[LUBE]

2. Cleaning of Suction Filter

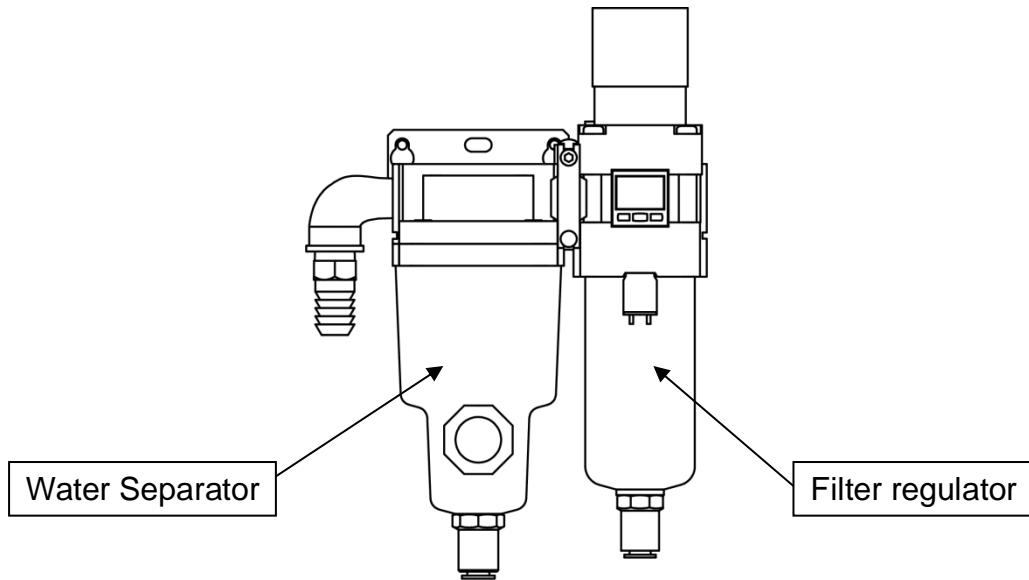
Take off the suction filter from inside the tank. Clean it with cleaner oil.



Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Q-2 Air Unit

Air unit is located at the back of the machine.



[Air Unit]

[Maintenance]

Replace the filter element immediately at expiry.

Water accumulated inside the filter must be drained.
Otherwise, water may flow out to the secondary side.

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Q-3 Air Filter

1. Water Separator

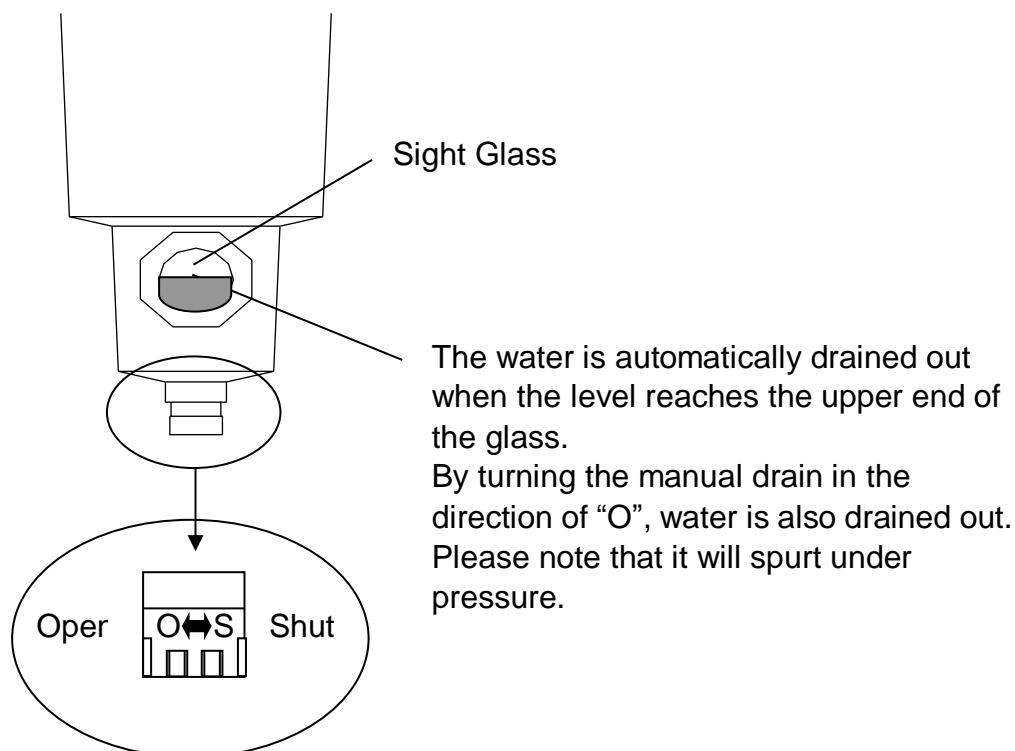
This is Air filter (mist separator). It is located on the right hand side of the electric box (Ref.R-1).

Time to replace Filter element with new one

When the differential pressure reaches 0.1MPa, filter element is to be replaced.

When 2 years has passed, filter element is to be replaced regardless of the differential pressure.

Following the below procedure, replace the element immediately with new one. At the same time, replace O ring and gasket, too.

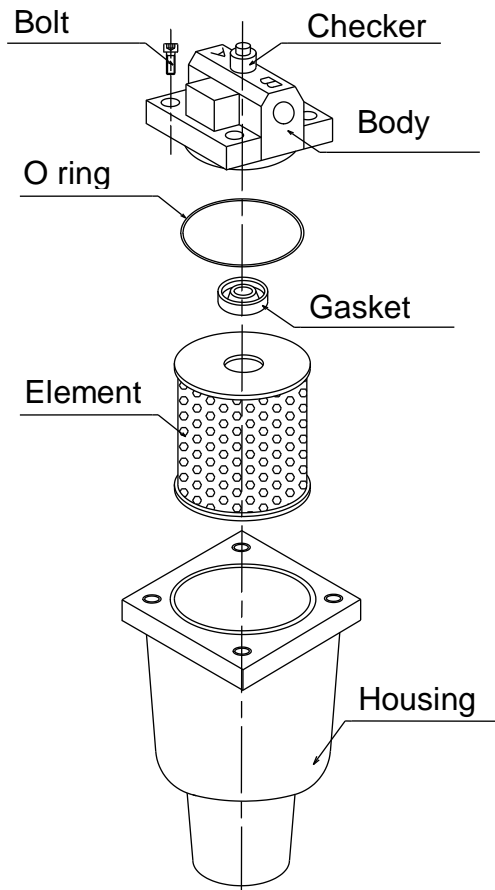


Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Work	Procedure
Disassemble	1) Loosen 4 cap bolts on the flange of the body to take off the housing.
Assemble	2) Set a new O ring to the body.
	3) Set a new gasket to the body.
	4) Put a new element with a hole upside into the housing.
	5) Tighten the 4 cap bolts to fix the housing to the body.

Note: At disassembly/assembly, be sure to stop air supply.
This is to remove the inside pressure.

Description	Part Code
Element	AM-EL350
O ring	
Gasket	



Q. PERIODICAL CHECK-UPS AND MAINTENANCE

2. Filter regulator

Time to replace Filter element with new one

When 2 years has passed, filter element is to be replaced.

This filter regulator is equipped with Auto Drain.

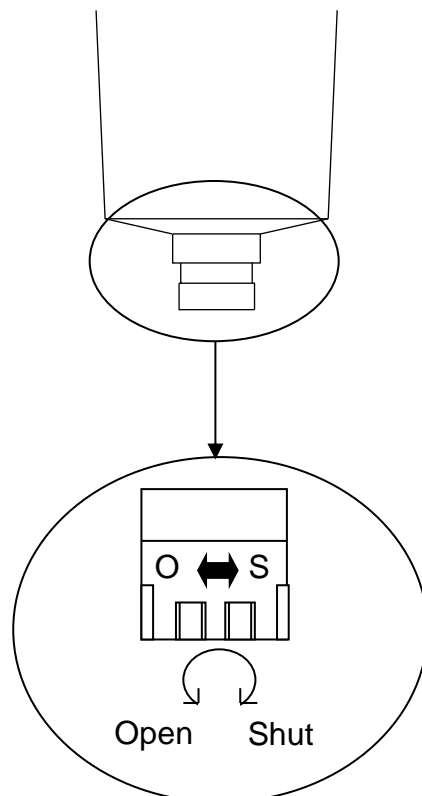
Drainage from Auto Drain

At the bottom of Auto Drain, there is a knob.

Usually it should be tightened in the direction of [S]. For drainage, loosen it in the direction of [O].

When pressure remains inside the filter, the fluid can spurt.

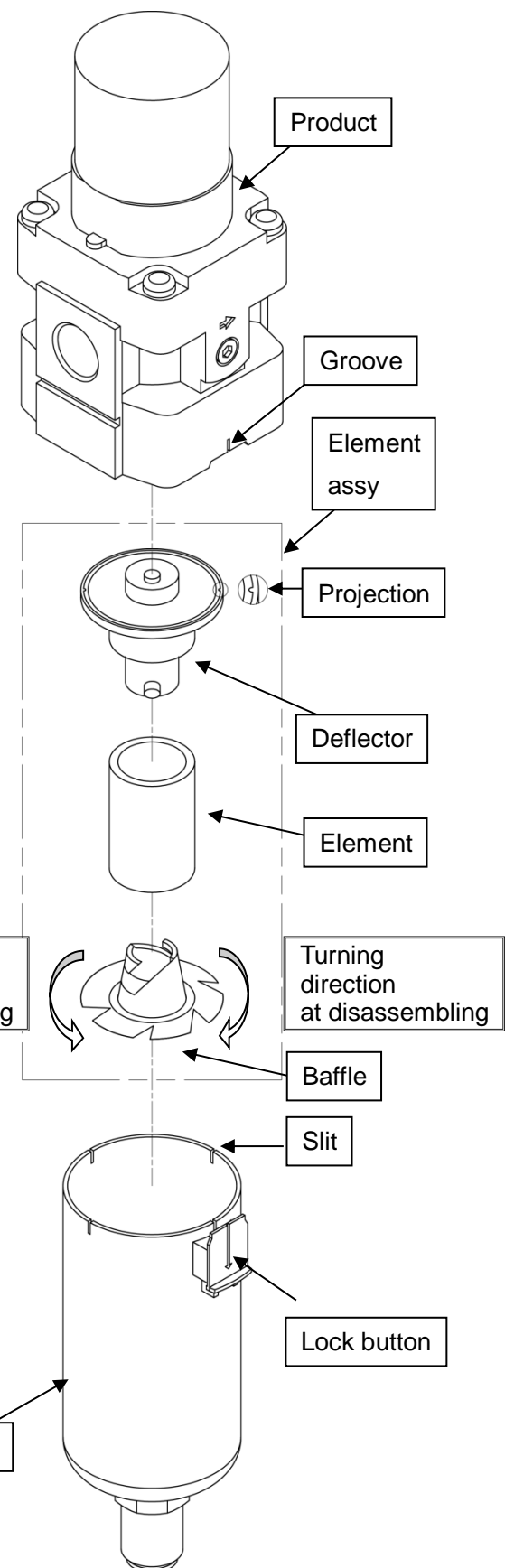
.



Q. PERIODICAL CHECK-UPS AND MAINTENANCE

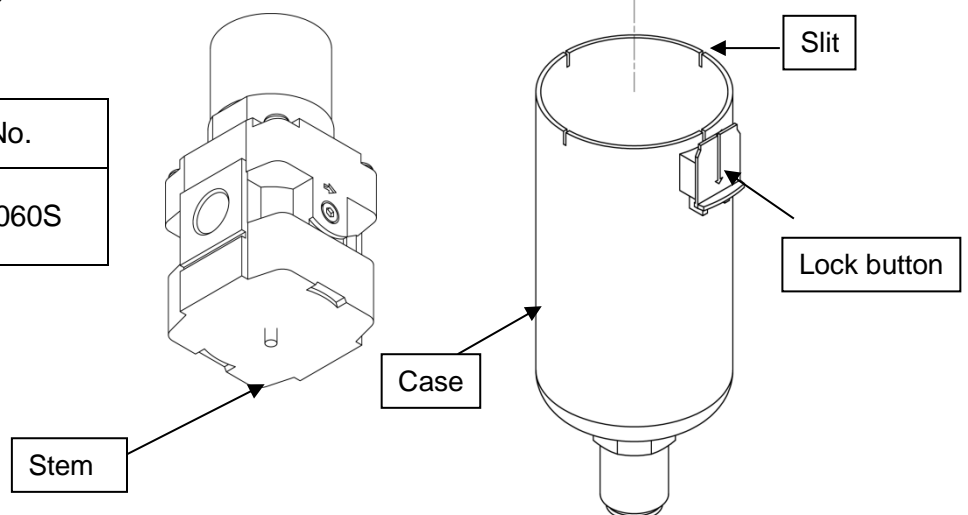
How to replace element of filter regulator

Work	Procedure
Dis-assembly	1) Remove the case assy from the product. Note: Be careful not to pull out the stem.
	2) Turn the element assy 45 deg. in either direction and remove it.
	3) Turning the baffle in the indicated direction, remove the element,
Assembly	1) Attach the element to the deflector, then fix the baffle in the indicated direction,
	2) Attach the element assy to the case, and turning the case in either direction by 45 deg., make the projections of the element assy meet the slits of the case.
	3) Attach the case assy to the product, and turn the case assy until the lock button meets the groove of the product. Check that the lock button is locked on the groove of the product before pressurization.



Note: Stop supply of air before disassembling of the Filter regulator.

Part Name	Part No.
Element	AF40P-060S



Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Q-4 Cooling Fan in Electric Box



DANGER

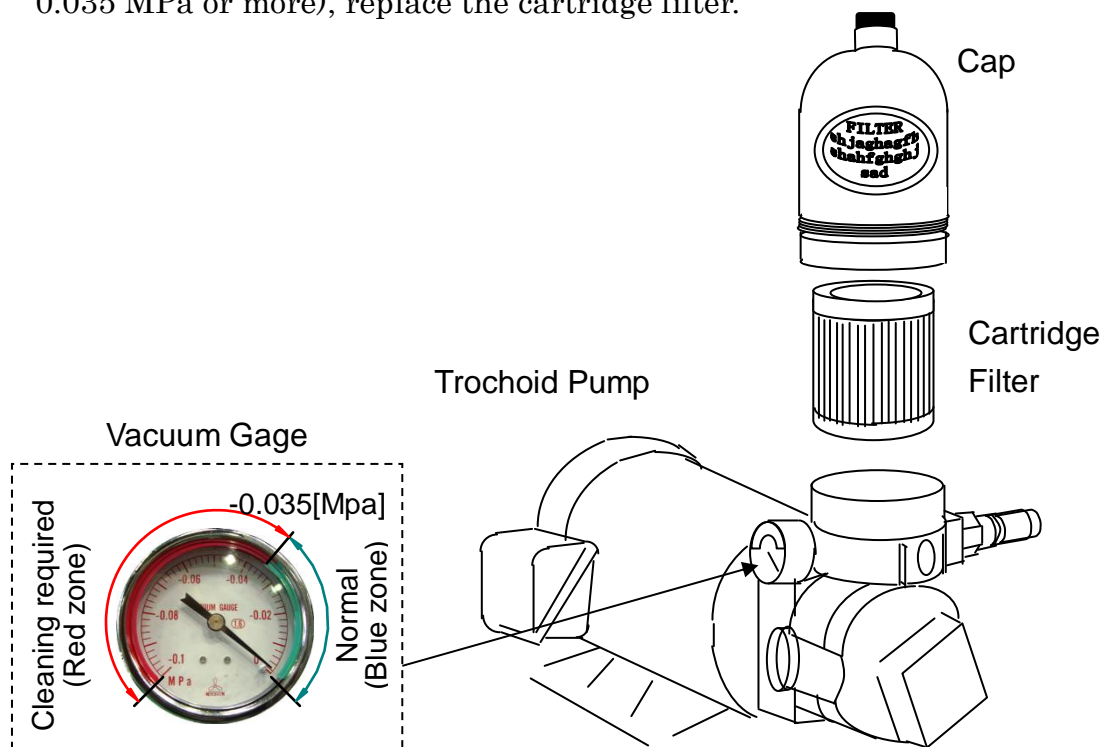
- Only qualified personnel are authorized to carry out power connection.
- To prevent other people from turning power on by mistake during servicing inside the electric box, place a tag or placard “NEVER TURN POWER ON” at a prominent place.

Clean the filters of the cooling fans, using compressed air, monthly.

Q-5 Trochoid Pump (Option)

If your machine has an optional coolant through spindle system, there is a trochoid pump (as shown below) attached to the coolant tank.

If the vacuum gage points to the red zone (pressure loss of 0.035 MPa or more), replace the cartridge filter.



Q. PERIODICAL CHECK-UPS AND MAINTENANCE

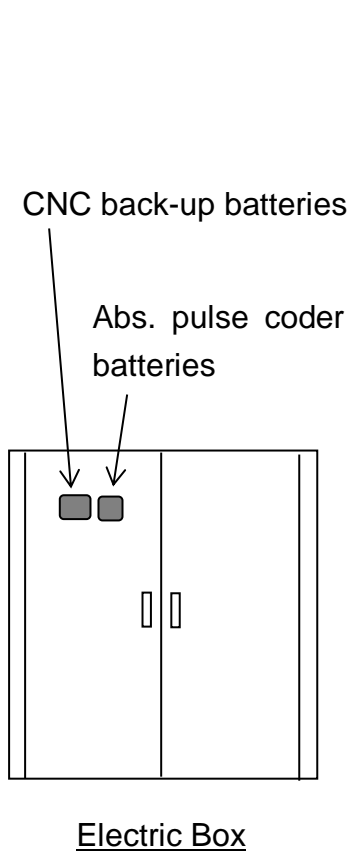
Q-6 How to Replace Batteries

Batteries are set for back-up memory of programs, offset amount and parameters for CNC, and of data such as absolute positions for the absolute pulse coders. When the battery voltage falls, a message will be displayed on the LCD. Batteries must be exchanged within one week after the first display. Otherwise all the memory above mentioned may be lost.

Even if the message is not displayed, please replace the batteries once a year.

(If the machine has a multi-pallet APC unit, also replace the battery for the absolute pulse coder of the pallet rotating table once a year.)

a) CNC back-up batteries



When the battery voltage drops, **BAT** is displayed on the LCD.

Please replace the batteries with new ones referring to FANUC Operator's manual (1.3.1 "When using commercial alkaline dry cells" of Chapter IV "MAINTENANCE").

Batteries are contained in the battery case attached on the electric box door. Batteries can be replaced safely without opening the doors.

Note: Use only the specified batteries.

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

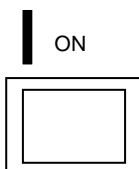
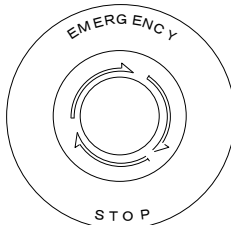
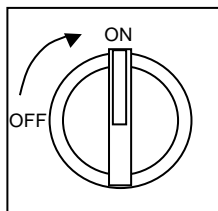
c) Absolute pulse coder battery for multi-pallet APC unit (option)

If the machine has a multi-pallet APC unit, a lithium battery is set for the absolute pulse coder memory back-up of the Beta amplifier unit. When this battery voltage drops, Operator message No. 2520 is displayed on the LCD.

Please replace the battery with new one (Code No. A06B-6093-K001), following the steps below.



Replacement of this battery requires work inside the electric box of the 6-pallet APC unit with power on. Only qualified personnel are authorized to carry it out.



Procedure

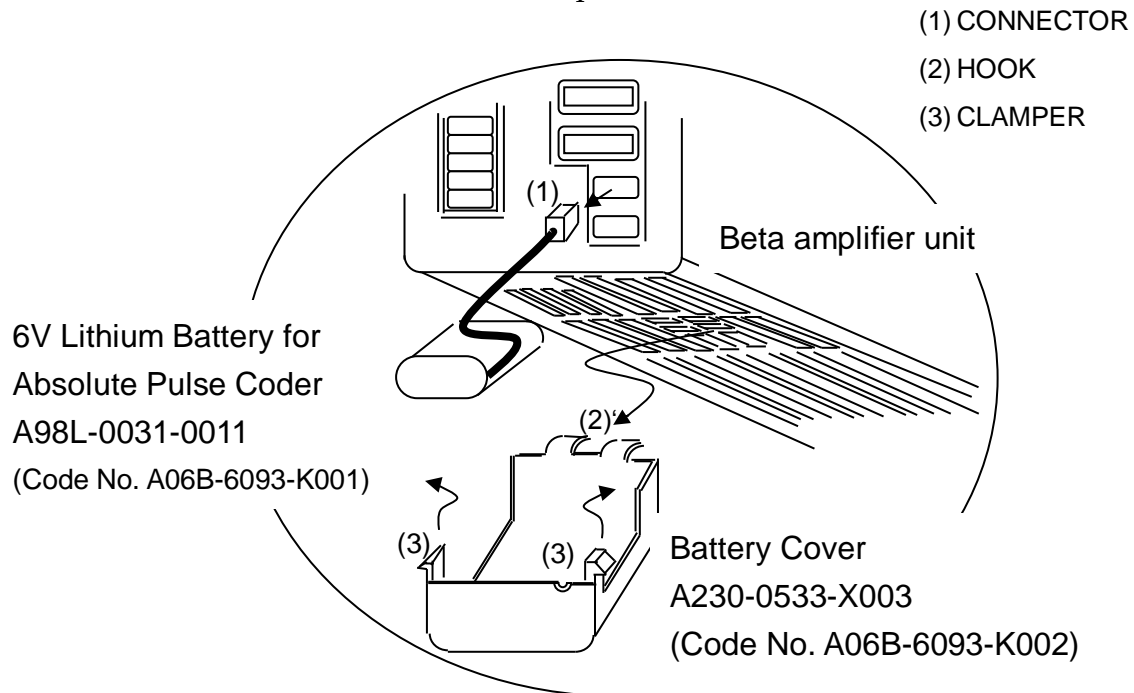
1. Turn Main Switch "ON".
2. Check that Emergency Stop Pushbutton (61) is pressed down.
3. Press NC ON pushbutton (56). The lamp is lit on.

Note 1: When the NC is already on, Steps 1 and 3 are not necessary.

Note 2: If the battery is replaced while power is off, the memory of the absolute position is erased. In this case, Zero point setting of the pallet rotating table becomes necessary. Refer to Appendix VI of this manual.

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

4. Open the door of the electric box of the multi-pallet APC unit.
5. Take off the battery cover at the bottom of the Beta amplifier unit.



6. Take off the connector (1) of the battery.
7. Replace the battery with new one.
8. Connect the connector (1) to the Beta amplifier unit.
9. Attach the battery cover to the Beta amplifier unit.
10. Close the electric box.

Note: If the Beta amplifier unit shows an abnormal indication, Zero point setting of the pallet rotating table is necessary.

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Q-7 Daily Check Sheet

NO	CHECK POINTS	CHECK ITEM	NOTE	1	2	3	4	5	6	7
1	Lubrication Tank	*Lubricant amount sufficient? *Lubricant oil clean?	Add if necessary							
2	Oil Cooler for Spindle Jacket Cooling System (Option)	*Fluid amount sufficient? *Fluid clean? *No clog on air filter? (Clean once in 2 weeks.)								
3	Coolant Tank	*Coolant amount sufficient and clean? *No clog on filter?	Add if necessary							
4	Slide Surfaces	*Lubricated sufficiently? *No damage on wipers?								
5	Air Unit	*Color of indicator is green?								
6	Pressure Gauges	*Air/Hydraulic pressure sufficient?								
7	Piping, etc.	*No leakage of air, oil or coolant?								
8	Motor, Gear Box, etc.	*No abnormal noise or vibration? *No abnormal heating?								
9	Moving Section -Column (X) -Spindle Head (Y) -Saddle (Z) -Rotary Table (B) -ATC Unit -ATC Magazine -APC	*Check oil level on rotary table, and ATC unit. *No abnormal noise or vibration? *Operation is smooth and proper?								
10	Operation Panel	*Operation of switches, levers and/or lamps is proper?								
11	Safety Device	*Soft OT functions properly?								
12	Cooling Fan	*Cooling fans turning?	Ref. Q-3							
13	Wiring, Cables	*No damage or disconnection?								
14	Hydraulic unit	*Check oil level.								
15	ATC Magazine	*Tool holders set correctly? *Tools fixed correctly?								
16	Spindle Head	*No abnormal noise, vibration or heat?								
17	Machined Product	*Machining accuracy kept good?								
18	LCD Screen	*[ALM] and/or [BAT] not displayed?	Ref. Q-5							
19	Trochoid Pump (Option)	*Doesn't the pointer enter yellow or red zone?	Ref. Q-4							
20	Chiller for Core Cooling System (Option)	*No clog on air filter?								
21	Cleaning	*Clean table surface, inside chip bucket, slide covers and inside spindle taper. *Remove chips.	After operation (every day)							

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

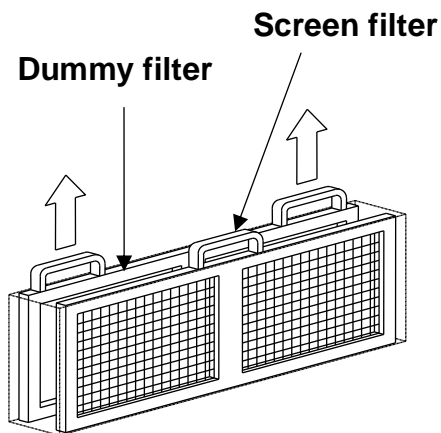
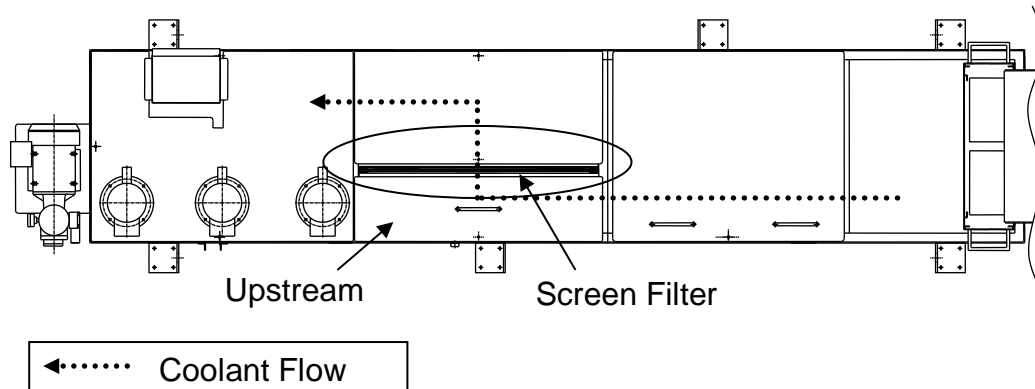
Q-8 Semi-Annual Check Sheet

NO.	CHECK POINTS	CHECK ITEM	NOTE	6	12	18	24	30	36
1	Lubrication Tank	*Clean inside tank. *Clean suction filter.	Ref. Q-1						
2	Oil Cooler for Spindle (Option)	*Replace oil inside the unit. *Clean air filter.							
3	Pressure Gauges	*Pressure gauge indication normal?							
4	Coolant Tank	*Clean inside tank. *No clog on filter?	Ref. P-2						
5	Air Unit	*Clean filter or replace filter element. *No air leakage on air unit or piping?	Ref. Q-2						
6	Piping, etc.	*No oil leakage? *No coolant leakage?							
7	Spindle Head	*Spindle runs with no vibration? *No abnormal sound?							
8	X, Y, Z, B-axes	*No abnormal sound or vibration while axis traverse? *Check slide seals.							
9	AC Servo Motors for axes and ATC Magazine	*No abnormal sound, vibration or heat? *No looseness on cannon connector?							
10	Spindle AC Motor	*No abnormal sound, vibration or heat? *Check insulation resistance.							
11	Other AC Motors	*Check insulation resistance. *No abnormal sound or heat on bearings?							
12	Gear Box and Other Rotating Section	*No abnormal sound, vibration or heat?							
13	Operation Panel, Electric Box, Connectors, Cooling Fan, Cable	*No damage or disconnection? *No looseness of connectors? Tighten them if necessary.							
		*No looseness on terminal screws? *Check functions by operation.							
		*Check contacts of magnet switches in electric box. *Push in control relays if necessary.							
		*Clean air filter. *Clean cooling fan.	Ref. Q-3						
14	Chip Conveyor (Option)	*Lubricate transmission. *Disassemble to clean.							
15	Leveling	*Check machine level with level gauge. Adjust it if necessary.							
16	Hydraulic Unit	*Replace oil inside the unit.							
17	Rotary Table	*Replace oil inside the unit.	Ref. B-2						
18	Chiller for Core Cooling System (Option)	*No clog on air filter?							

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

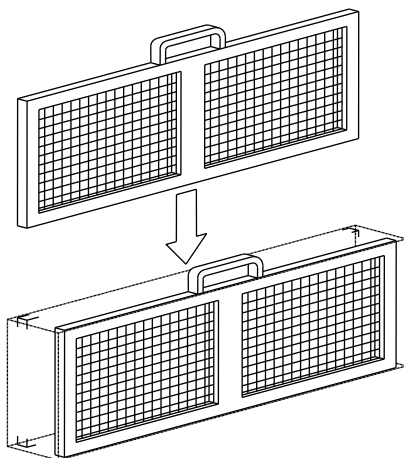
Q-9 How to Replace Screen Filters

Before cleaning, replace the screen filters in the following way.



A Dummy filter is set at the back (downstream) of the screen filter.

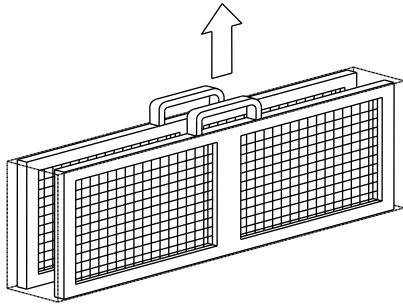
Remove the dummy filter first.



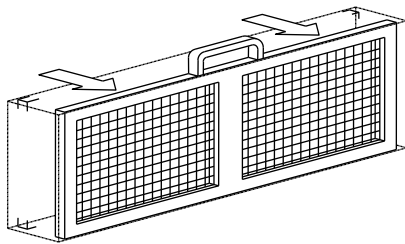
In place of the dummy filter, set a new (clean) screen filter.

Note: Be sure to set the new screen filter behind the existing screen filter.

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

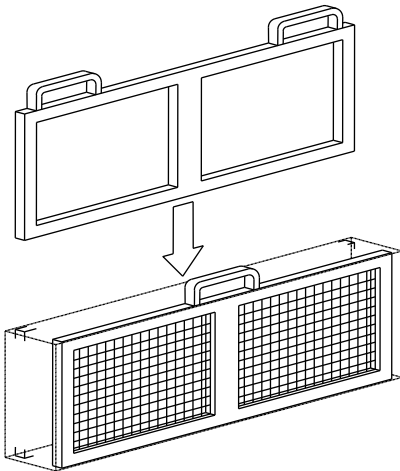


Now remove the existing screen filter.



Move the new screen filter forward (upstream).

Note: Do not lift the screen filter up while moving.



Set the dummy filter behind the new screen filter.

Clean the removed screen filter and keep it until next replacement.

Note: Do not use two screen filters at a time in normal operation.

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

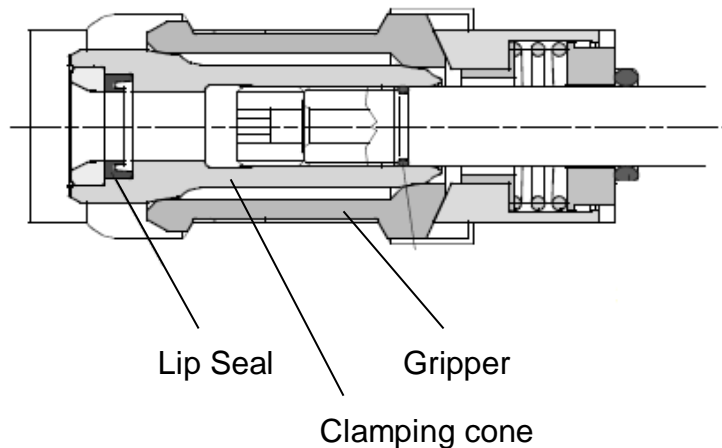
Q-10 Maintenance of HSK Spindle (Option)

Section 1 Preventive Maintenance Schedule

To guarantee the function of the drawbar, the following preventive maintenance schedule must be adhered to.

[Every week]

- Check the lip seal in the clamping unit (visual check).



- Check the gripper for pollution or damage; is it sufficiently greased (visual check)?

Pay attention:

The greasing cycle depends on the loss of lubrication in the clamping unit.

Possible causes for the loss of lubrication:

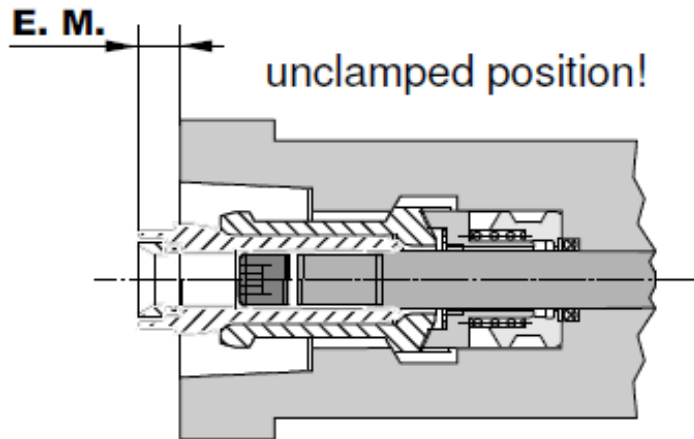
- Lip seal in the clamping cone is defective.
- Some type of coolant can dissolve grease.
- Cleaning spray from outside.

For greasing, see Section 2.

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

[Every six months]

- In unclamped position, check the gauge dimension E.M.
It should be 10.5 mm.



- Check if the spindle clamps a tool correctly.
- Test Pull-in-force;
If the pull-in-force is smaller than 70% of the nominal value, try the following procedures:
 - grease the clamping unit and test the pull-in force again.
 - exchange the gripper and test it again.
 - exchange the complete drawbar.

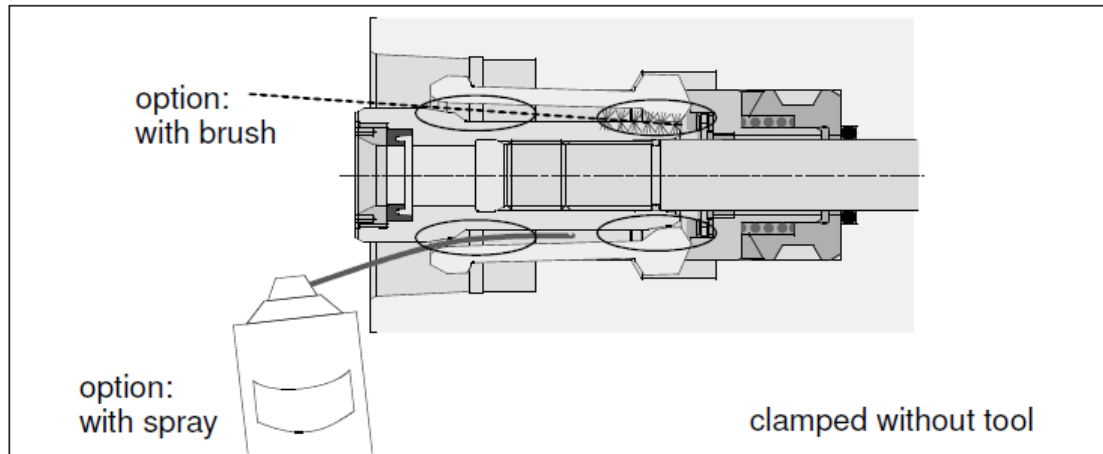
[Every year]

- Exchange the lip seal (see Section 4).

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Section 2 Greasing of Clamping Unit

Greasing in assembled condition



If it is very dirty, take the clamping unit out and clean it.
Then grease the clamping unit and reassemble.

Grease for HSK Clamping Unit

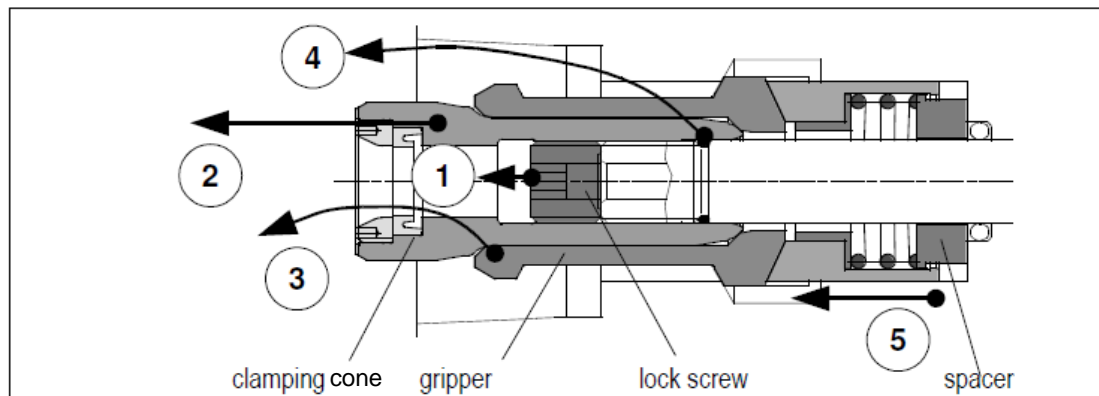
<i>name</i>	<i>quantity</i>	<i>order-no.</i>
METAFLUX-grease-paste Nr. 70-8508(standard)	4 g	0.929100.012
METAFLUX-moly-spray Nr. 70-82	400 ml	06.21001.010
KLÜBER-grease-paste ME 31-52	10 g	06.21001.014
KLÜBER-spray ALTEMP Q NB 50	400 ml	06.21001.015

Note: Use only grease of one company; do not mix the grease!

METAFLUX	Metaflux AG Industriestraße 11 CH-4313 Möhlin Tel.: +41-61-851 08 00 Fax: +41-61-851 08 08	KLÜBER	Klüber Lubrication München KG Postfach 701047 D-81310 München Tel.: (0 89) 78 76 -0 Fax: (0 89) 78 76 -333
	TECHNO-SERVICE GmbH Detmolder Straße 515 D-33605 Bielefeld Tel.: (05 21) 9 24 44 -0 Fax: (05 21) 20 74 32		

Q. PERIODICAL CHECK-UPS AND MAINTENANCE

Section 3 Disassembling of Clamping Unit

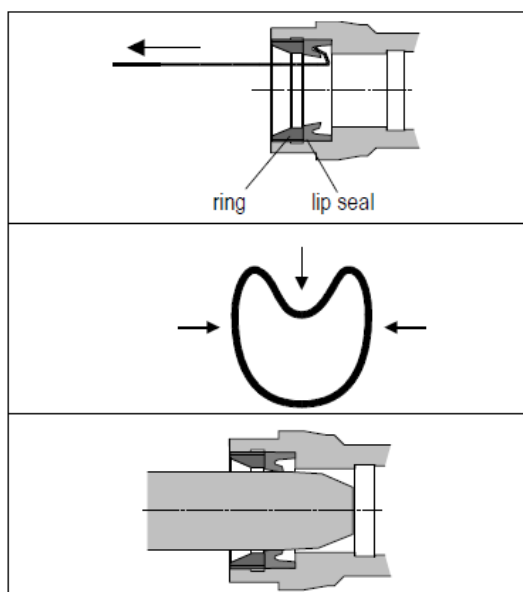


In unclamped position:

1. loosen lock screw
2. unscrew clamping cone
3. remove gripper segments with light tilting movements
4. remove O-ring from drawbar
5. remove spacer using 2 long nose pliers or tweezers;
optional with HSK63: use disassembling tools

Section 4 Exchange of Lip Seal

For dismounting the lip seal, it is not necessary to take the ring away.



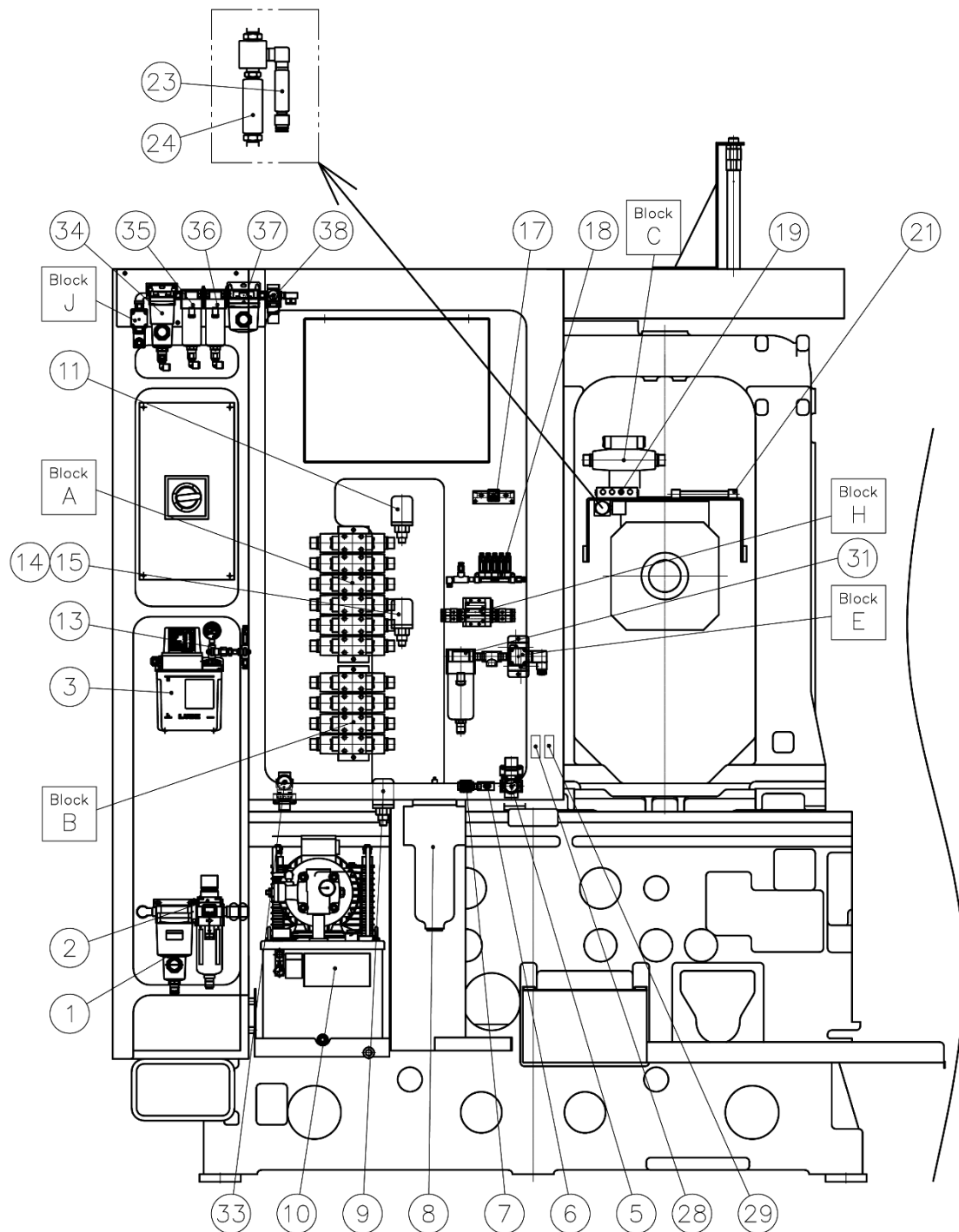
- Take away the damaged lip seal with a hook or pliers
- Compress the lip ring and insert it in the clamping cone.
- Press the seal with a blunt object against the lining.
- Take a mandrel to bring it in the final position.

R. HYDRAULIC AND PNEUMATIC COMPONENTS

R. HYDRAULIC AND PNEUMATIC COMPONENTS

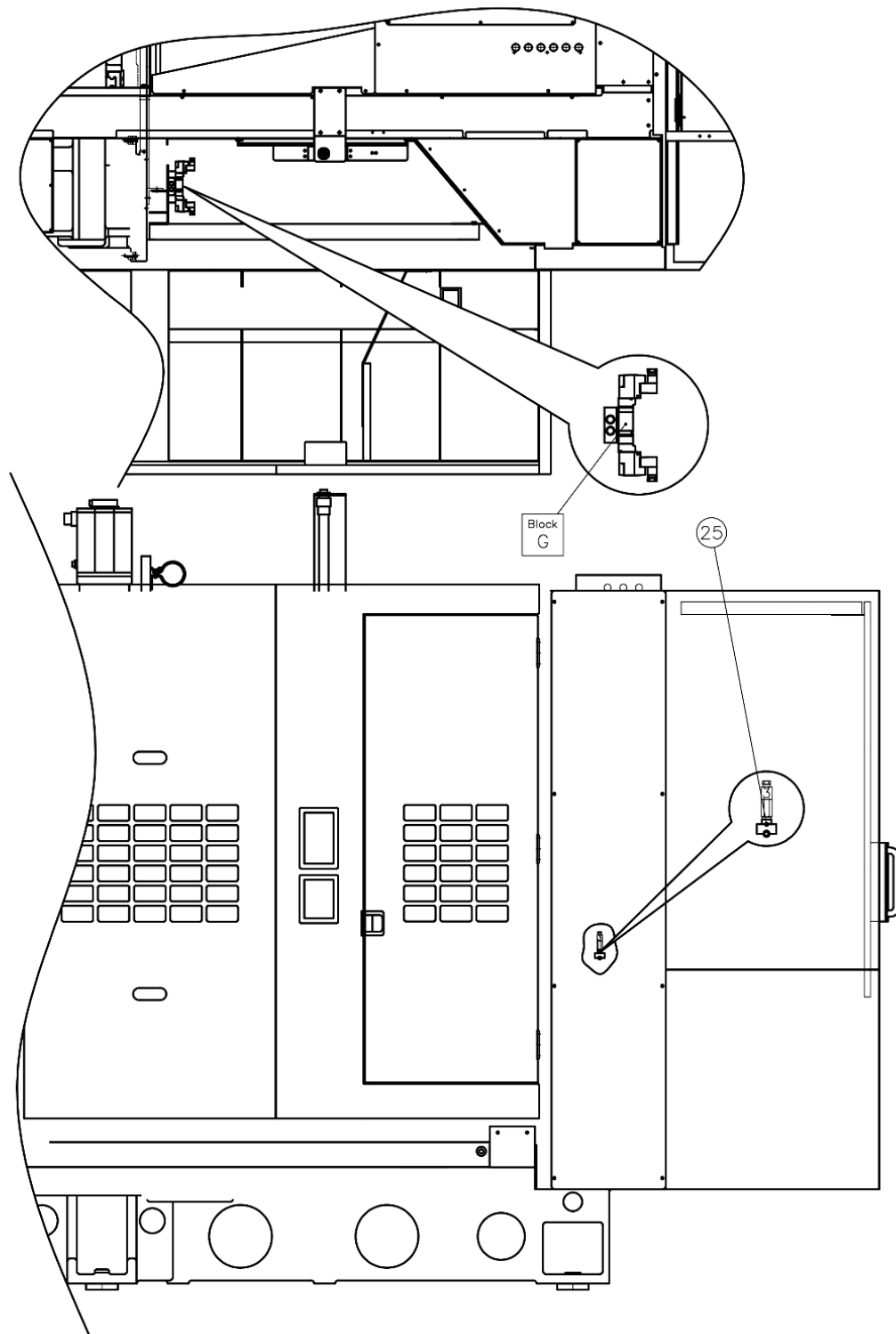
R-1 Layout of Components

(Machine Rear Side)



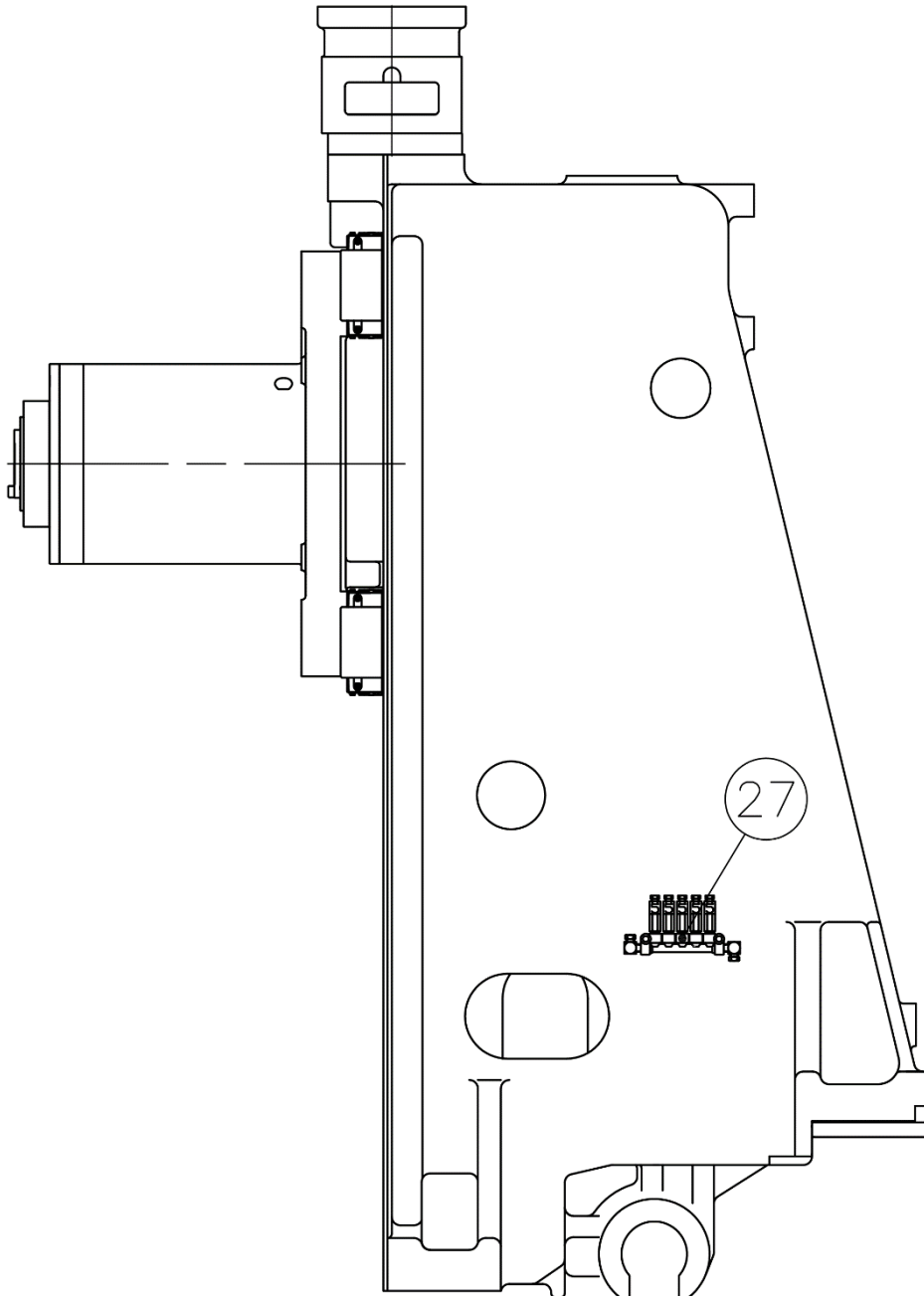
R. HYDRAULIC AND PNEUMATIC COMPONENTS

(Machine Top / Magazine Side)



R. HYDRAULIC AND PNEUMATIC COMPONENTS

(Column Right Side)



R. HYDRAULIC AND PNEUMATIC COMPONENTS

R-2 Solenoid Valve

Block Ⓐ (Hydraulic Solenoid Valve)		
SOL22		SOL40
SOL24		SOL23
SOL34		SOL33
SOL26		SOL25
SOL28		SOL27
SOL29		SOL32

Block Ⓑ (Hydraulic Solenoid Valve) ATC120		
SOL50		SOL51
SOL52		SOL53
SOL54		SOL55
SOL56		SOL57

Block Ⓑ (Hydraulic Solenoid Valve) ATC60		
SOL31		SOL30

Block Ⓒ (Hydraulic Solenoid Valve)		
SOL21		SOL20

Block Ⓔ (Air Solenoid Valve)		
SOL 7		

Block Ⓖ (Air Solenoid Valve)		
SOL 1		SOL 2

Block Ⓕ (Air Solenoid Valve)		
SOL 73		
SOL 5		
SOL 3		SOL 4
SOL 8		

Block Ⓙ (Air Solenoid Valve)		
SOL 58		

R. HYDRAULIC AND PNEUMATIC COMPONENTS

No.	Application	Remarks
SOL 1	ATC Shutter Open	Air Solenoid Valve
SOL 2	ATC Shutter Close	
SOL 3	Pallet Sitting Confirmation	
SOL 4	Pallet Air Blow	
SOL 5	Through Spindle Air Blow	
SOL 7	Oil & Air	
SOL 8	Coil Conveyer Air Purge	
SOL 58	Scale Air Blow (Option)	
SOL 73	MARPOSS Lid Open & Probe Up (Option)	
SOL 20	Spindle Tool Clamp	Hydraulic Solenoid Valve
SOL 21	Spindle Tool Unclamp	
SOL 22	Pallet Unclamp	
SOL 23	Pallet Down	
SOL 24	Pallet Up	
SOL 25	APC in CCW	
SOL 26	APC in CW	
SOL 27	APC in CCW (Acc.)	
SOL 28	APC in CW (Acc.)	
SOL 29	Rotary Table Clamp	
SOL 30	Tool Pot on Magazine Side	
SOL 31	Tool Pot on Double Arm Side	
SOL 32	Hydraulic Unit Warm-up	
SOL 40	Pallet Clamp	
SOL 33	Pallet Down (Acc.)	
SOL 34	Pallet Up (Acc.)	
SOL 50	Waiting Pot on Magazine Side	
SOL 51	Waiting Pot on Double Arm Side	
SOL 52	Pot Pulled Out	
SOL 53	Pot Pushed In	
SOL 54	Single Arm at Waiting Pot	
SOL 55	Single Arm at Magazine Pot	
SOL 56	Single Arm at Magazine Pot	
SOL 57	Single Arm at Home Position	

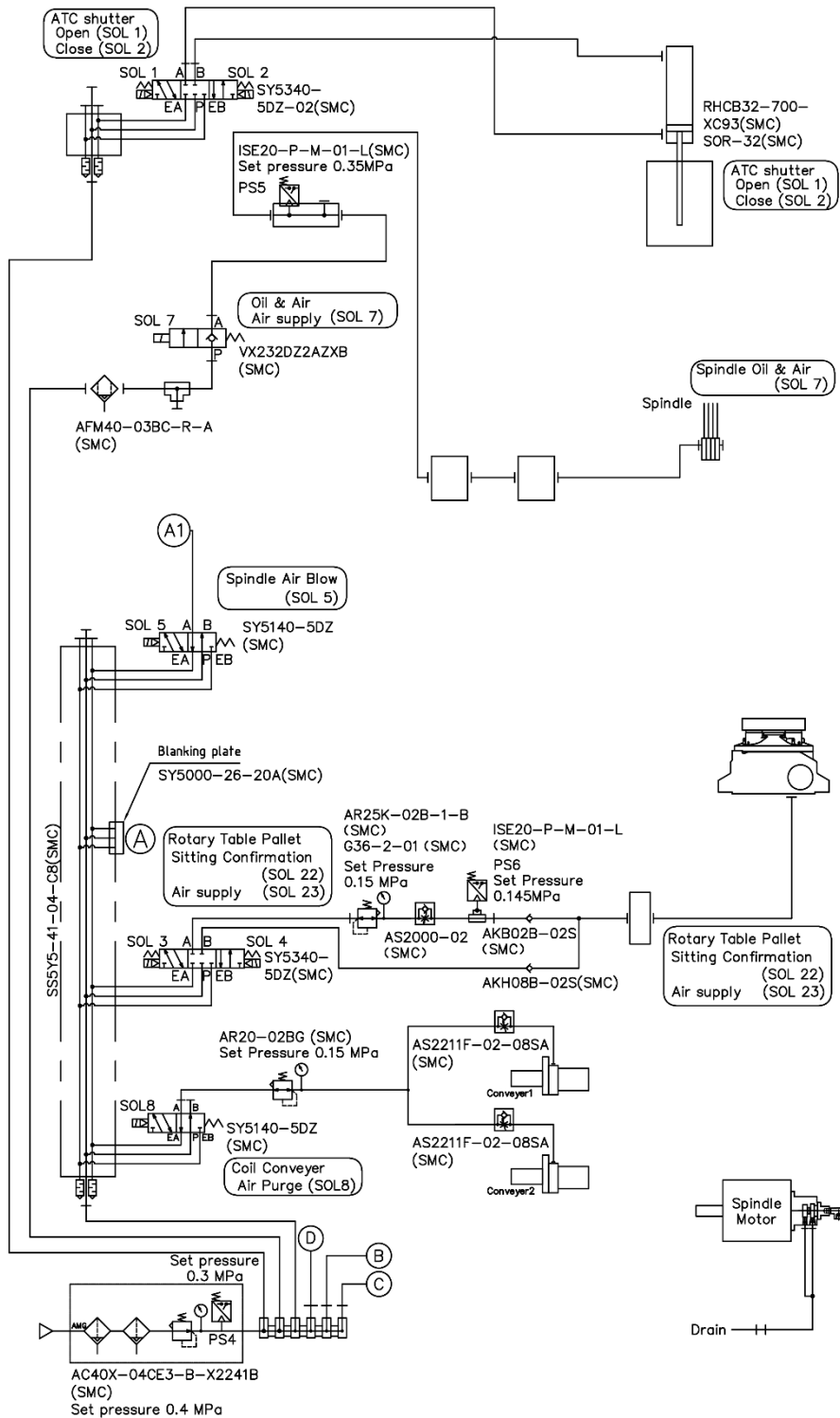
R. HYDRAULIC AND PNEUMATIC COMPONENTS

R-3 List of Other Components

No.	Application	Remarks
①	Air Filter (Source)	
②	Air Regulator / Pressure Switch	PS4
③	Lubrication Unit / Pressure Switch	PS3
⑤	Air Regulator (Pallet Sitting Confirmation)	
⑥	Speed Controller (Pallet Sitting Confirmation)	
⑦	Pressure Sensor (Pallet Sitting Confirmation)	PS6
⑧	Filter Assembly for Through Spindle Coolant	
⑨	Pressure Switch (Spindle Through Coolant)	PS7
⑩	Hydraulic Unit	
⑪	Pressure Switch (Pallet Unclamp)	PS1
⑬	MO Valve (Z-axis Support Bearing)	
⑭	Pressure Switch (B-axis Clamp)	PS9
⑮	Pressure Switch (B-axis Unclamp)	PS8
⑰	Pressure Switch (Oil & Air)	PS5
⑱	MO Valve (Z-axis)	
⑲	Mixing Valve (Spindle)	
⑳	MO Valve (Y-axis)	
㉓	Check Valve (Spindle Through Air Blow)	
㉔	Check Valve (Spindle Through Coolant)	
㉕	MO Valve (APC Rack & Pinion)	
㉗	MO Valve (X-axis)	
㉘	Speed Controller (Option)	MARPOSS
㉙	Speed Controller (Option)	
㉛	Air Filter (Oil&Air)	
㉝	Air Regulator (Spiral conveyor Air Purge)(Option)	
㉞	Water Separator (Option)	Linear Scale
㉟	Mist Separator (Option)	
㊱	Micro Mist Separator (Option)	
㊲	Super Mist Separator (Option)	
㊳	Regulator (Option)	

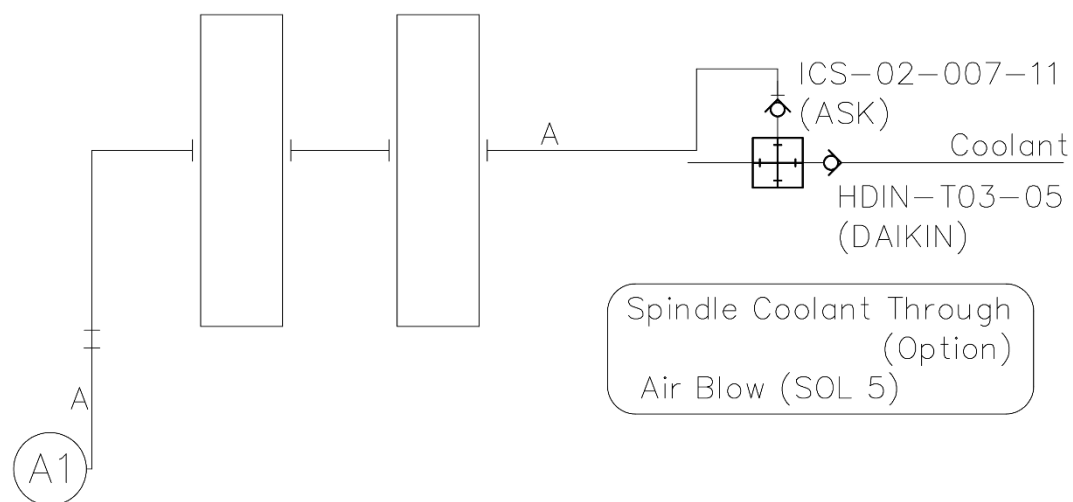
R. HYDRAULIC AND PNEUMATIC COMPONENTS

R-4 Air Circuit

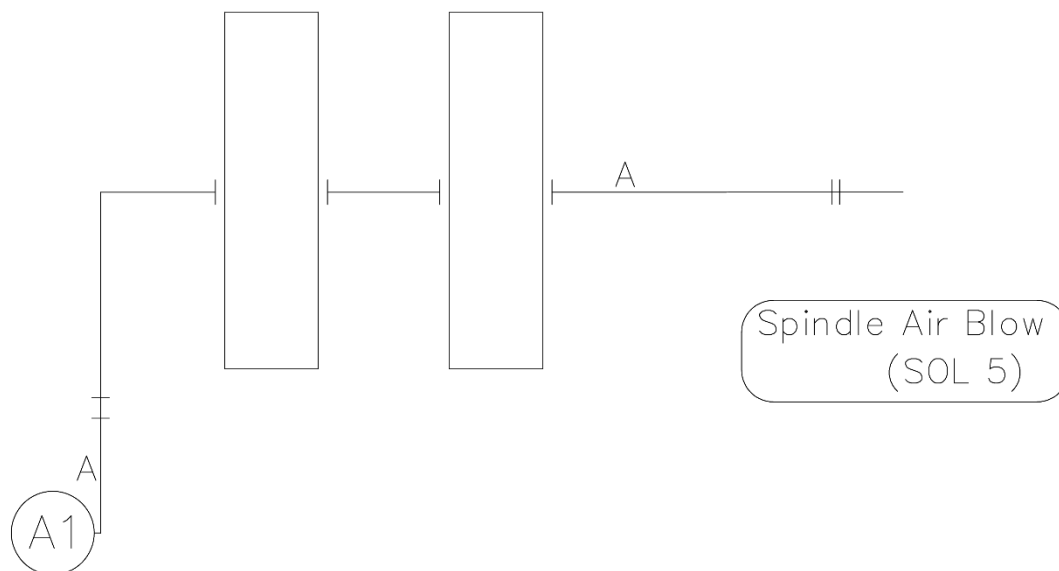


R. HYDRAULIC AND PNEUMATIC COMPONENTS

With Coolant Through Spindle (Option)



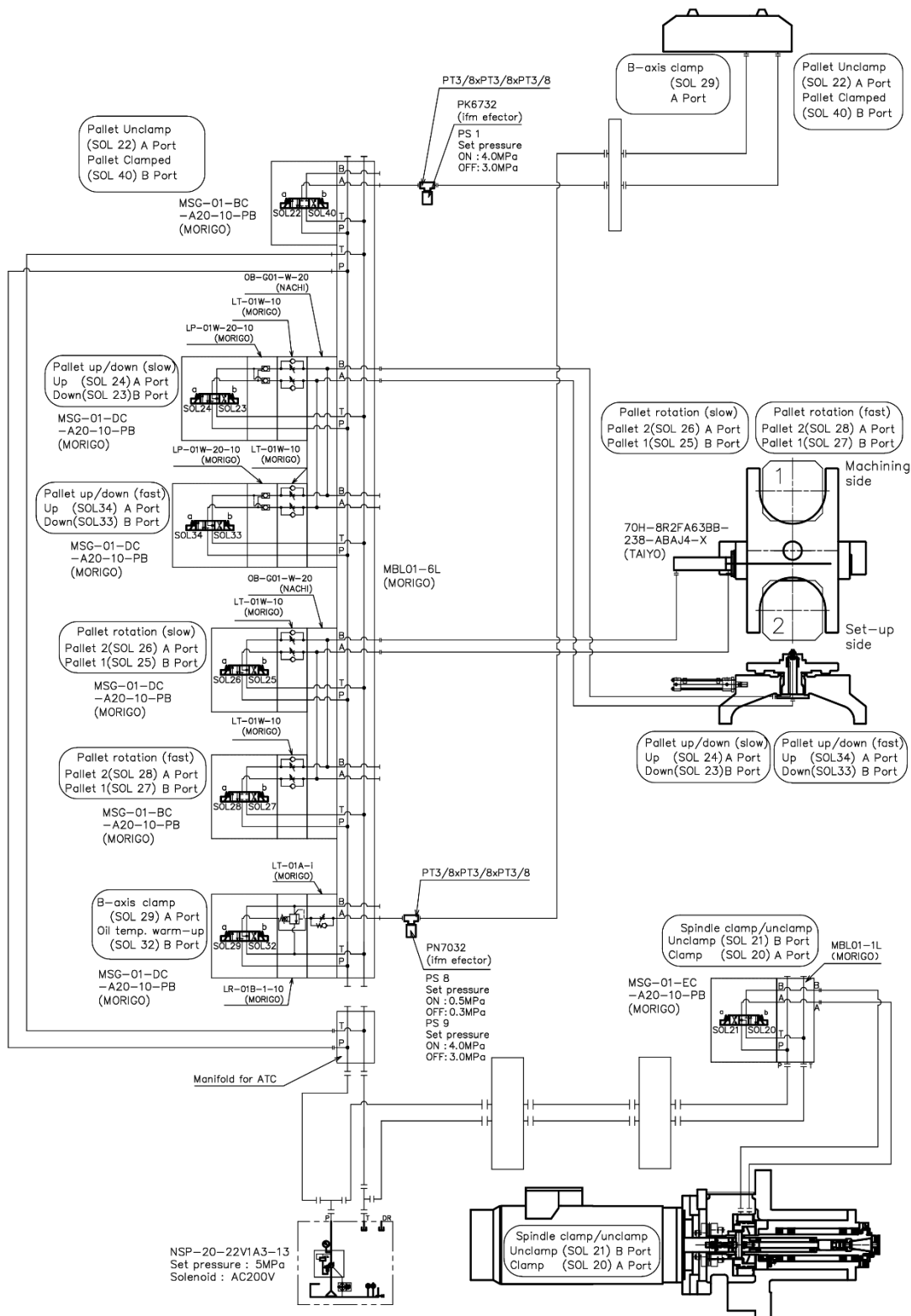
Without Coolant Through Spindle



R. HYDRAULIC AND PNEUMATIC COMPONENTS

R-5 Hydraulic Circuit

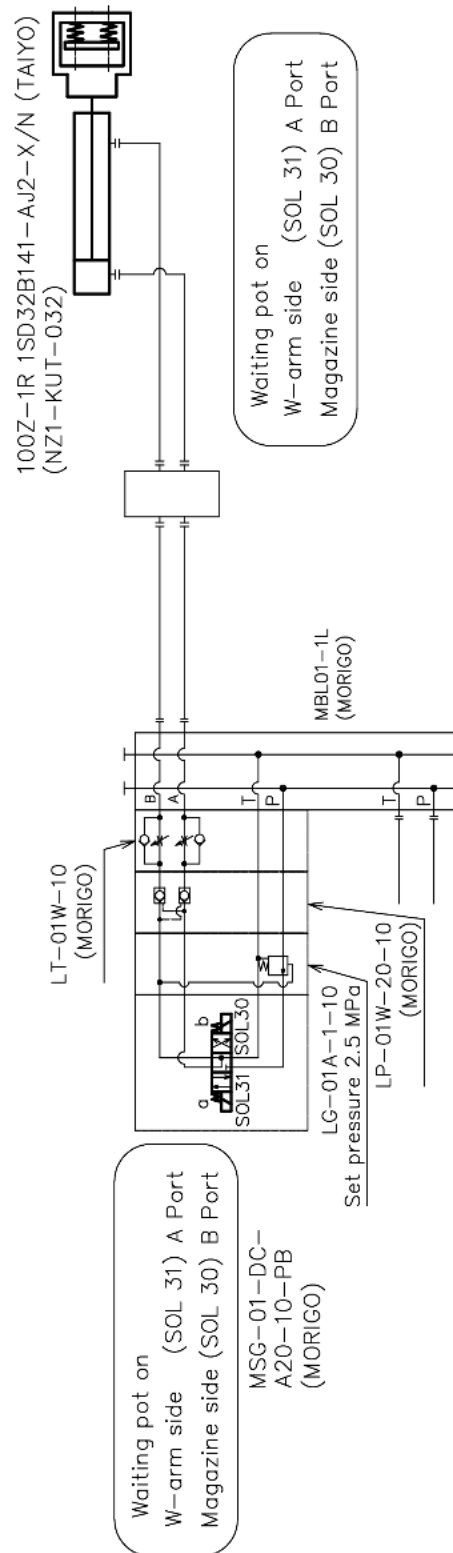
Main unit



R. HYDRAULIC AND PNEUMATIC COMPONENTS

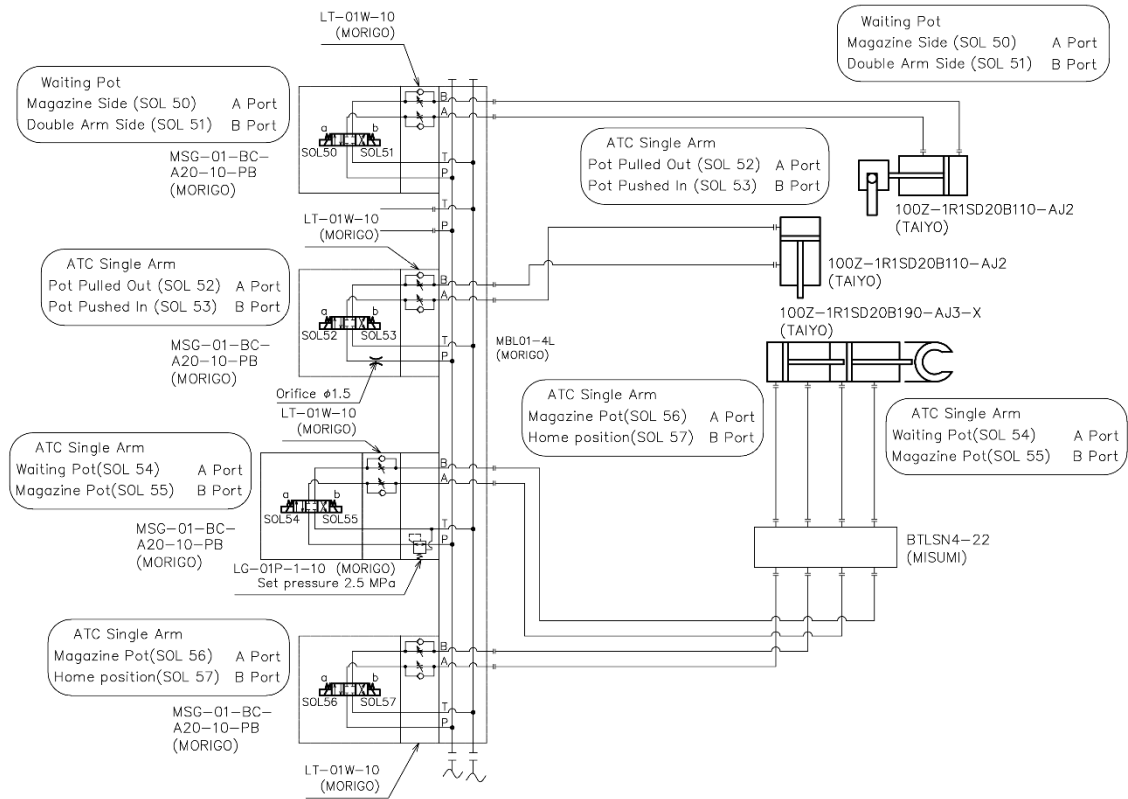
ATC

(40/60ATC)



R. HYDRAULIC AND PNEUMATIC COMPONENTS

(80/120ATC)

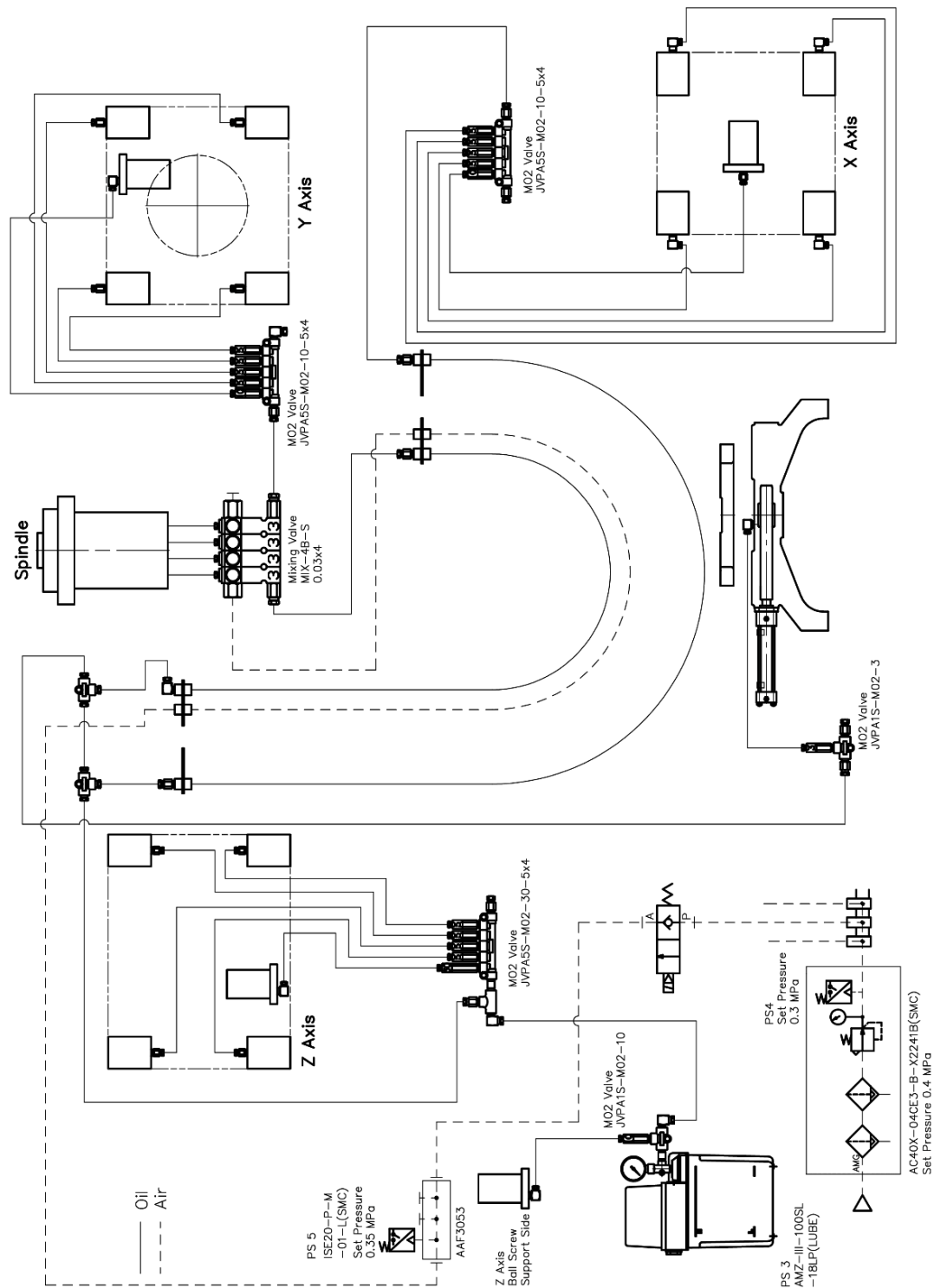


R. HYDRAULIC AND PNEUMATIC COMPONENTS

R-6 Lubrication Circuit

Note 1: The adjusters of the mixing valves were set properly at shipment. Do not change them.

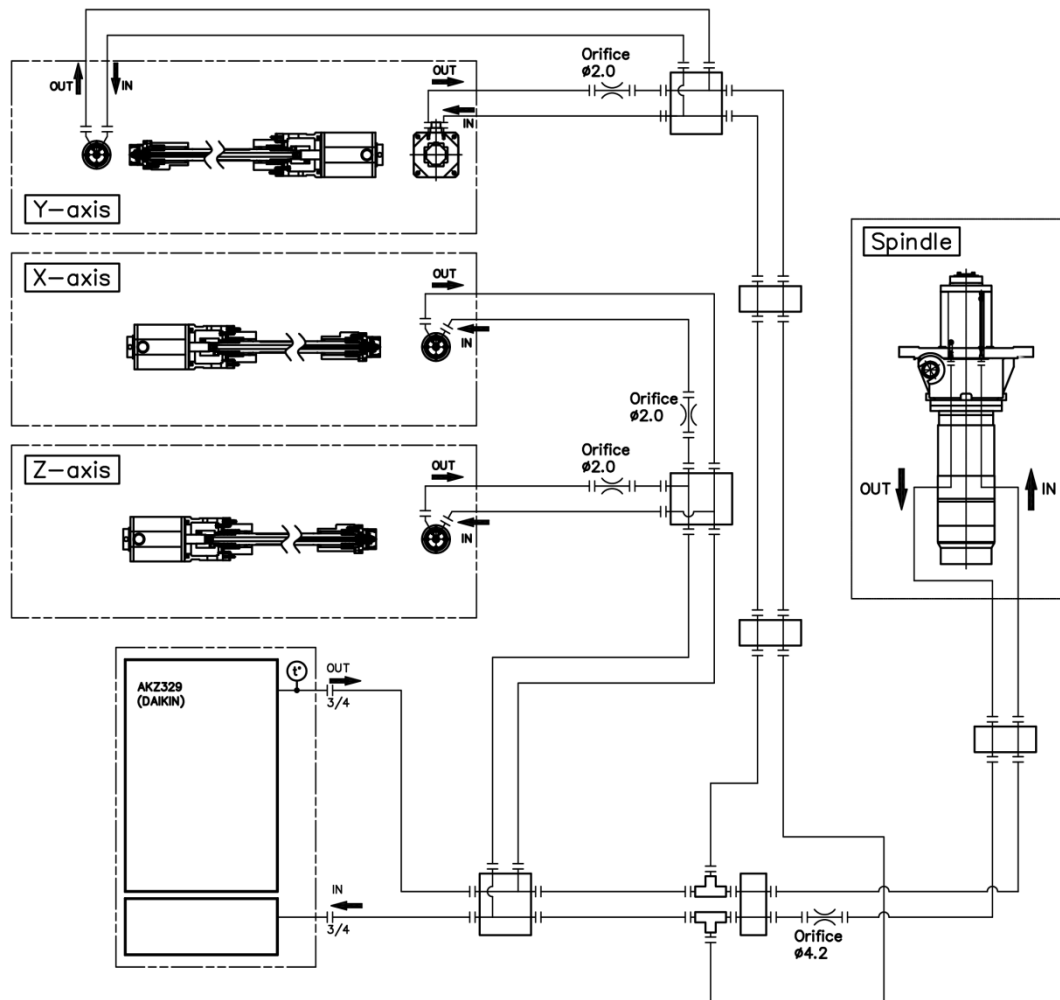
Note 2: Use the specified oil for the lubrication pump.



R. HYDRAULIC AND PNEUMATIC COMPONENTS

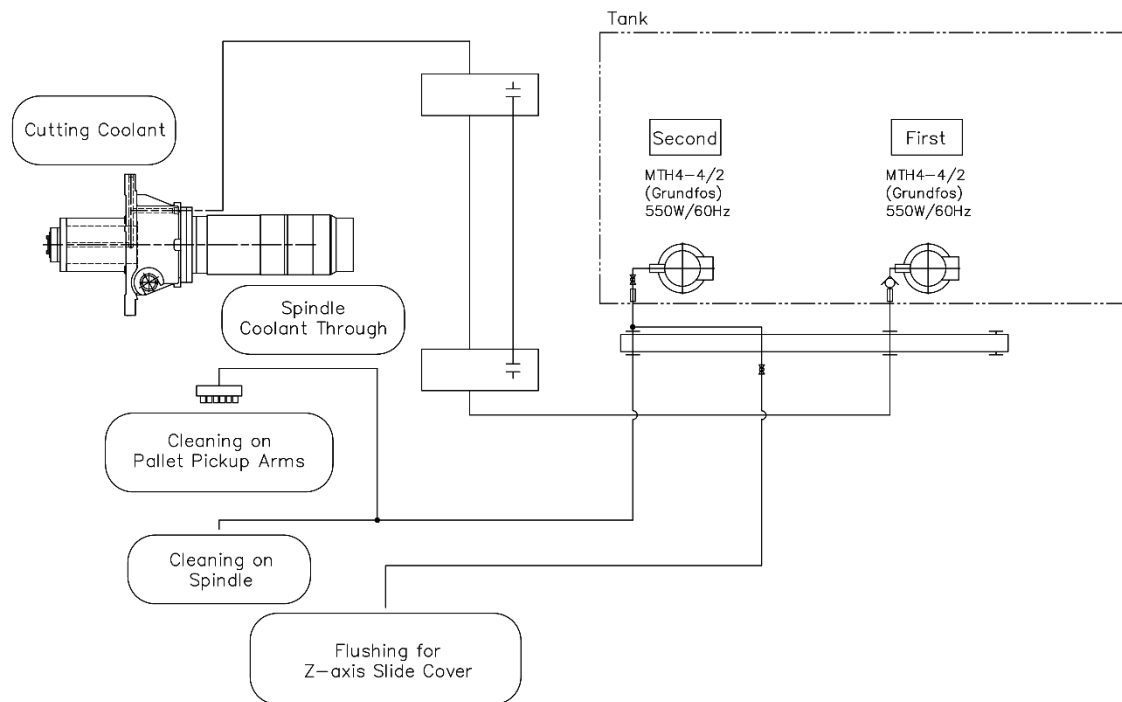
R-7 Other Circuits

Temperature Control Circuit



R. HYDRAULIC AND PNEUMATIC COMPONENTS

Coolant Circuit



Note: Coolant through spindle is optional.

S. LIMIT SWITCH

S. LIMIT SWITCH

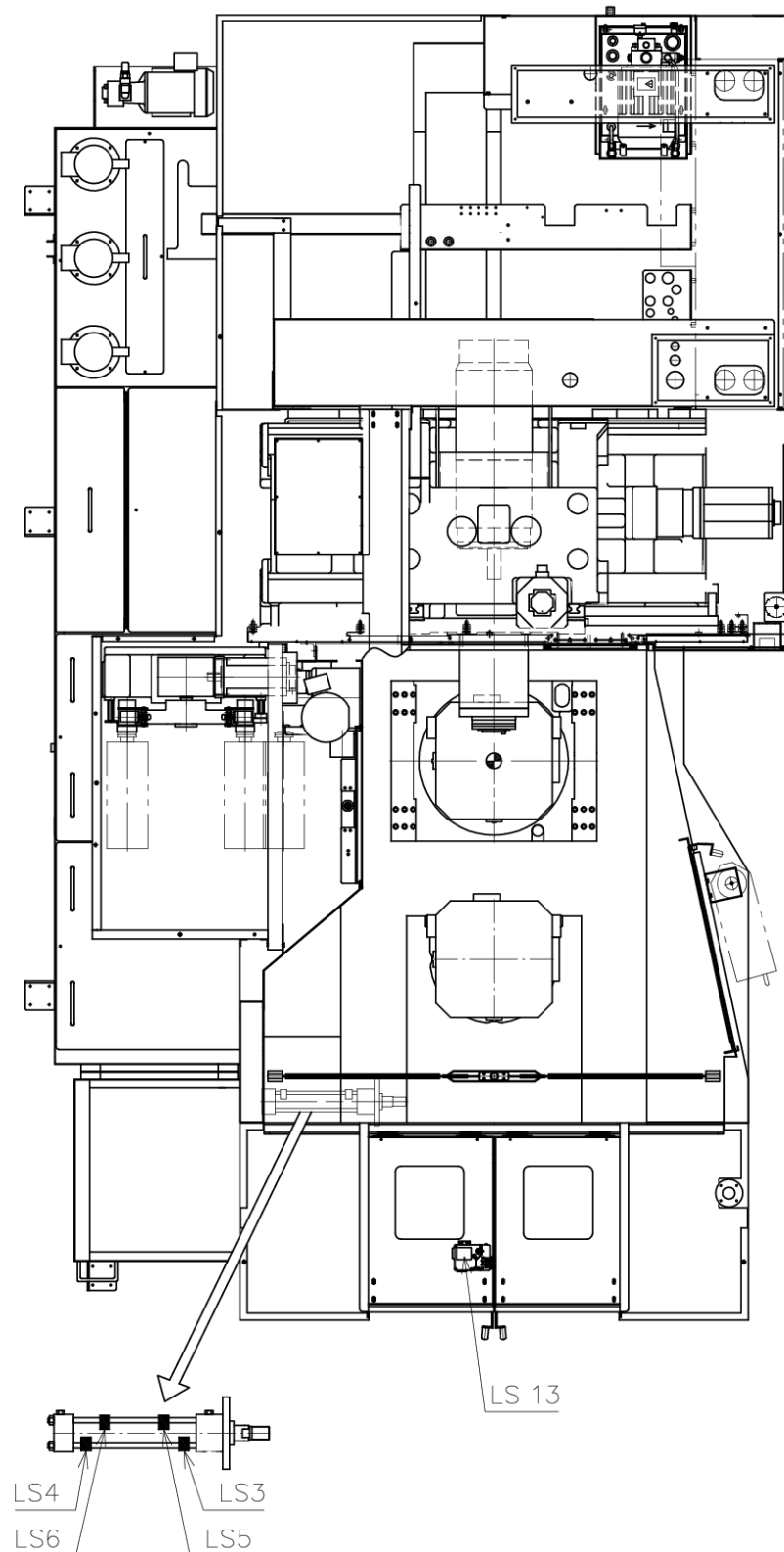
S-1 Limit Switch List

NO.	APPLICATION	LOCATION	MODEL (MAKER)
LS 1	Spindle Unclamped	Spindle	FL7M-3J6HD-L5 (AZBIL)
LS 2	Spindle Clamped	Spindle	FL7M-3J6HD-L5 (AZBIL)
LS 3	APC Rotation Cylinder Out	Cylinder for APC	AX115 (TAIYO)
LS 4	APC Rotation Cylinder Return	Cylinder for APC	AX115 (TAIYO)
LS 5	APC Rotation Acceleration 1	Cylinder for APC	AX115 (TAIYO)
LS 6	APC Rotation Acceleration 2	Cylinder for APC	AX115 (TAIYO)
LS 7	Pallets Up	APC Rotation Base	FL7M-3J6HD (AZBIL)
LS 8	Pallets Down	APC Rotation Base	FL7M-3J6HD (AZBIL)
LS 9	ATC Shutter Opened	Cylinder for ATC Shutter	FL7M-7J6HD (AZBIL)
LS10	ATC Shutter Closed	Cylinder for ATC Shutter	FL7M-7J6HD (AZBIL)
LS11	Operator Side Door Interlock	Operator Side Door	HS1L- DT44KMSR-R (IDEC)
LS12	ATC Door Interlock	ATC Door	HS1L- DT44KMSR-R (IDEC)
LS13	Set-up Door Interlock	Set-up Door (Left)	HS1L- DT44KMSR-R (IDEC)
LS15	Loading Side Pallet Indexing	Loading Side Pallet Bracket	FL7M-3J6HD (AZBIL)

S. LIMIT SWITCH

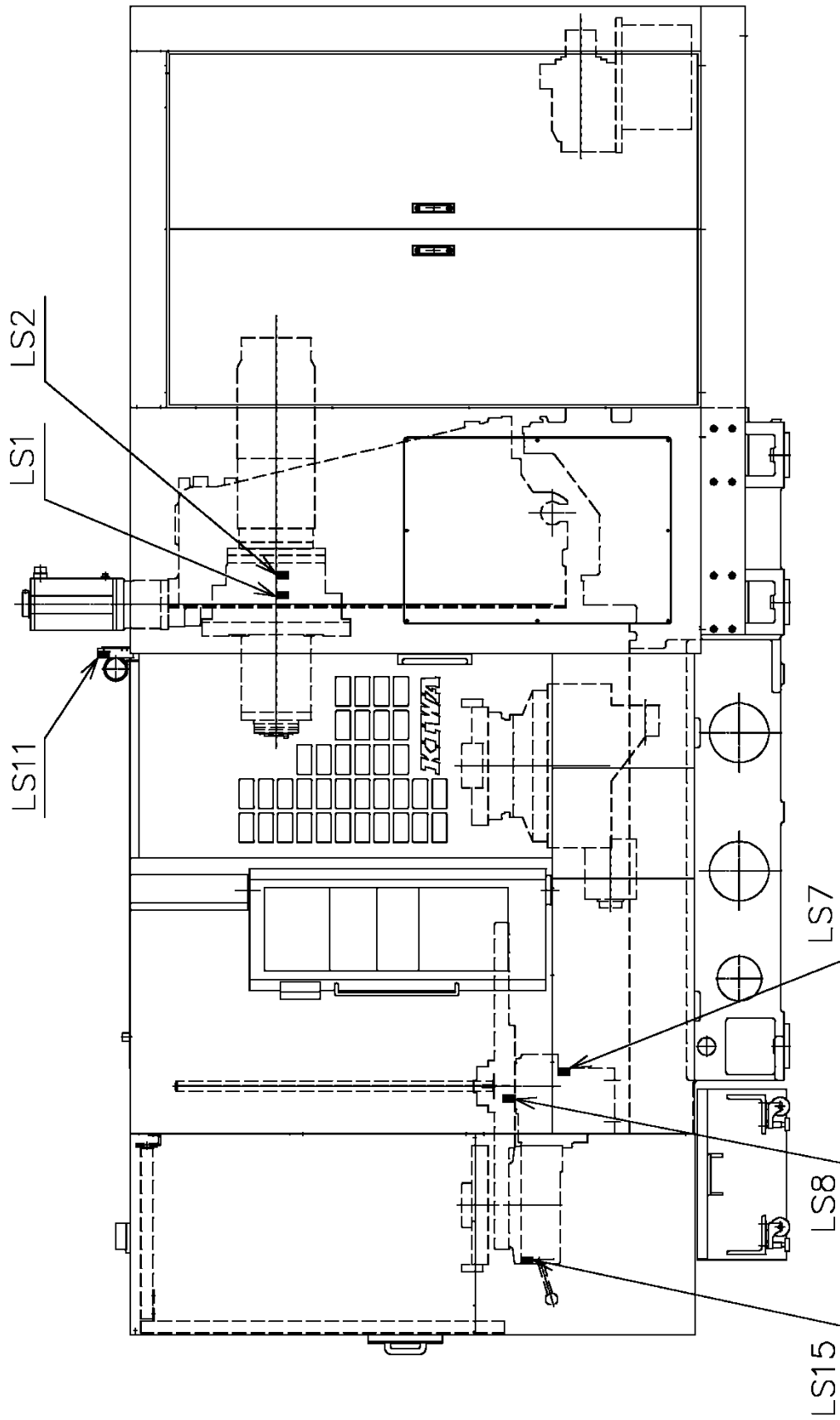
S-2 Limit Switch Arrangement

Drawing 1



S. LIMIT SWITCH

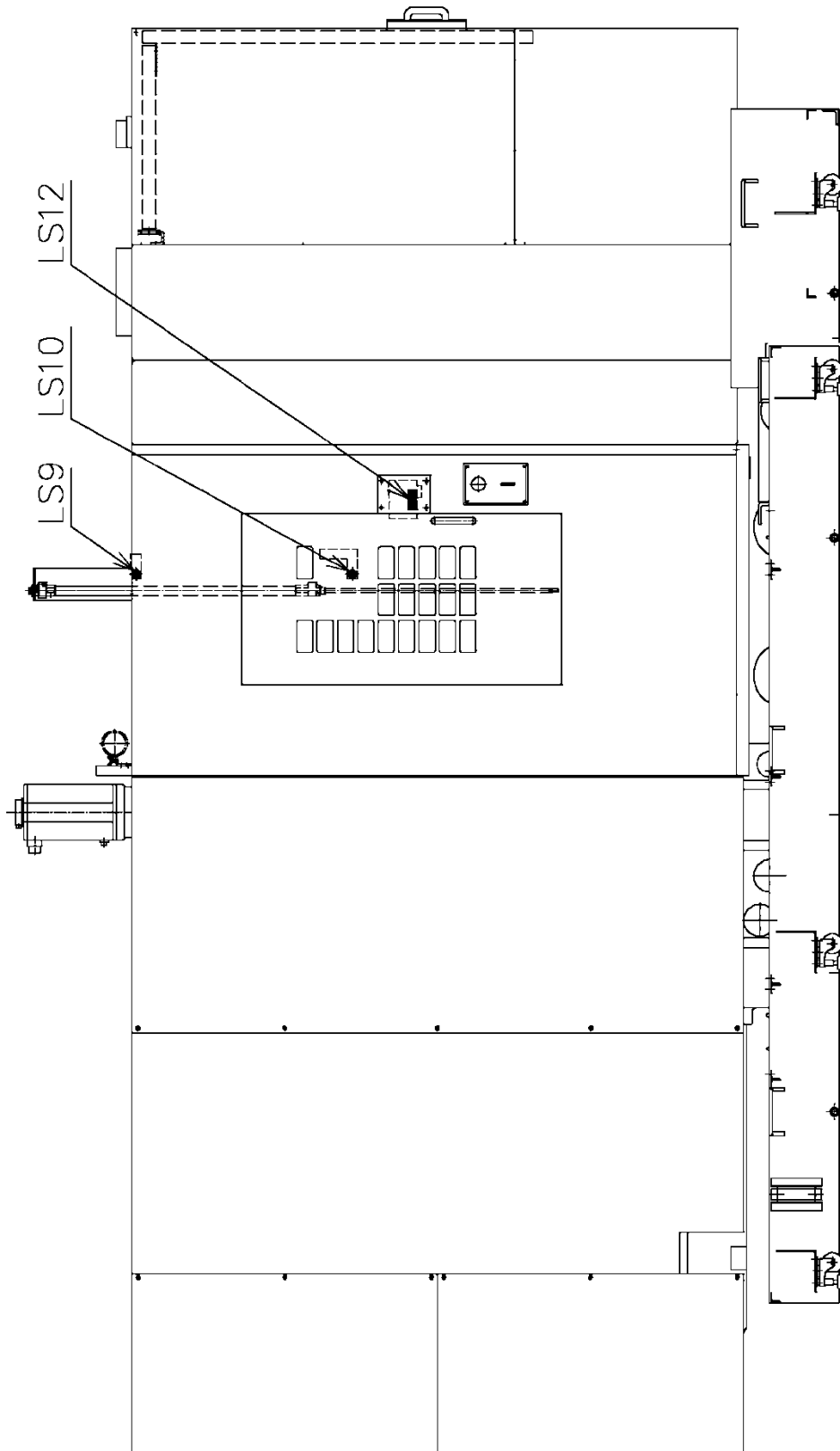
Drawing 2



S. LIMIT SWITCH

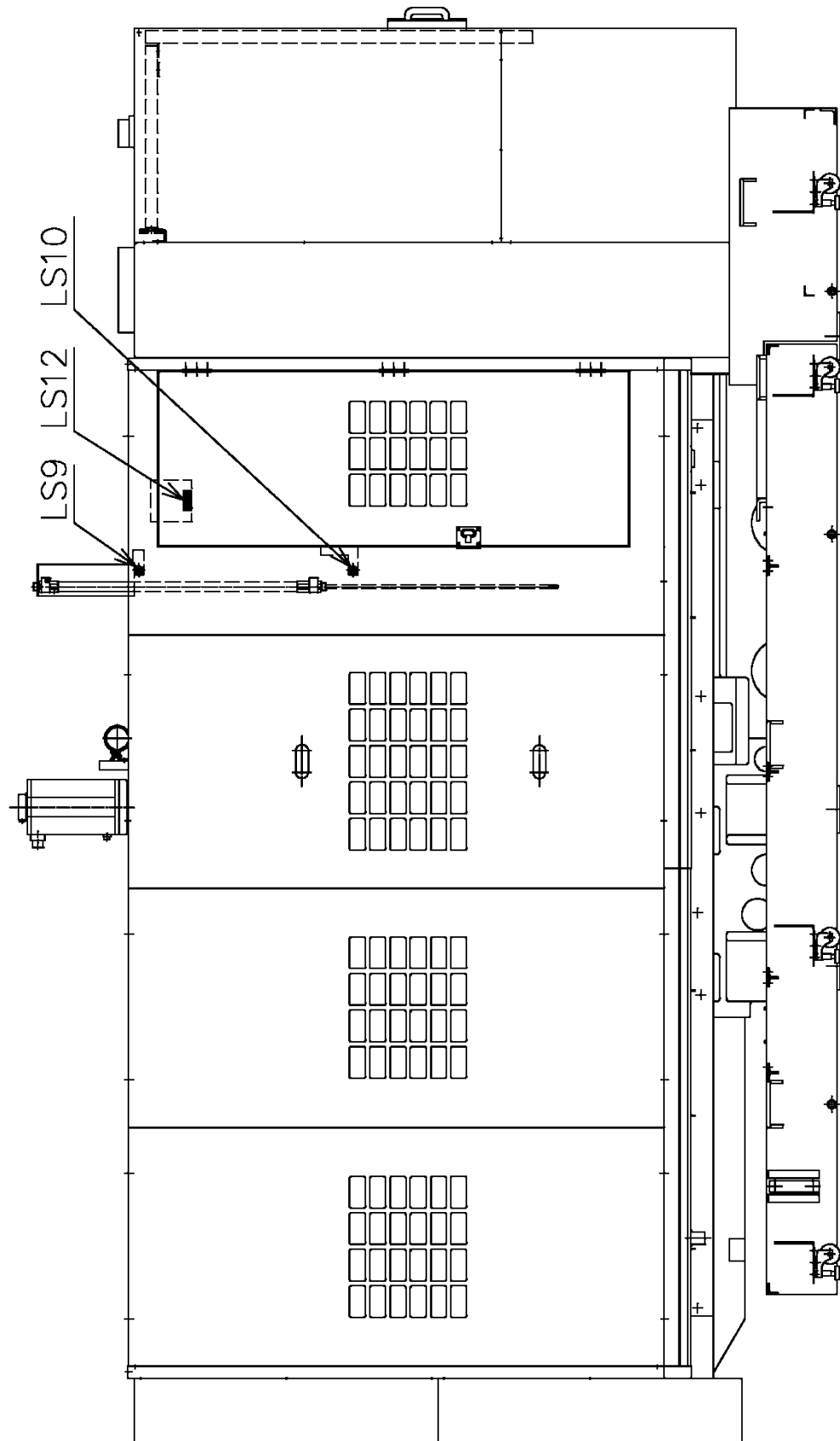
Drawing 3

(40/60ATC)



S. LIMIT SWITCH

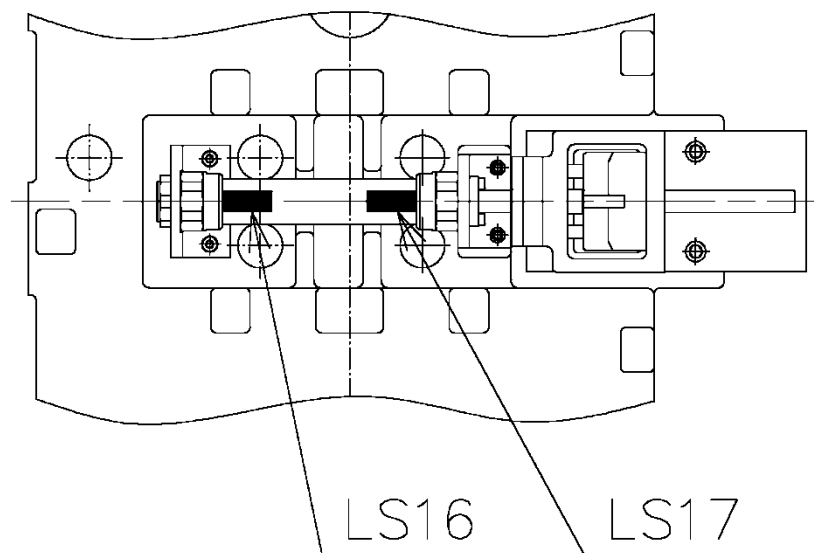
(80/120ATC)



S. LIMIT SWITCH

S-3 Limit Switches for ATC Pot Slider

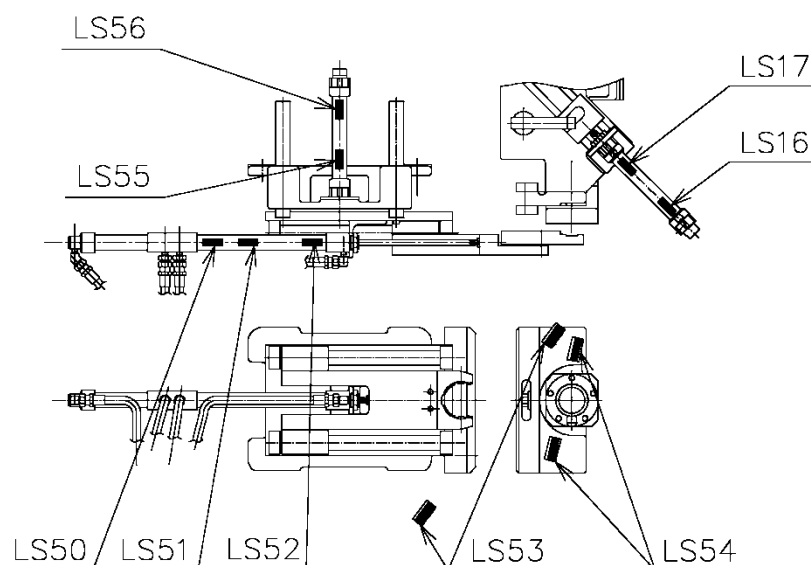
(40/60ATC)



NO.	APPLICATION	LOCATION	MODEL (MAKER)
LS16	Tool pot at magazine	Hydraulic cylinder for tool pot slide	AX115 (TAIYO)
LS17	Tool pot at double arm	Hydraulic cylinder for tool pot slide	AX115 (TAIYO)

S. LIMIT SWITCH

(80/120ATC)

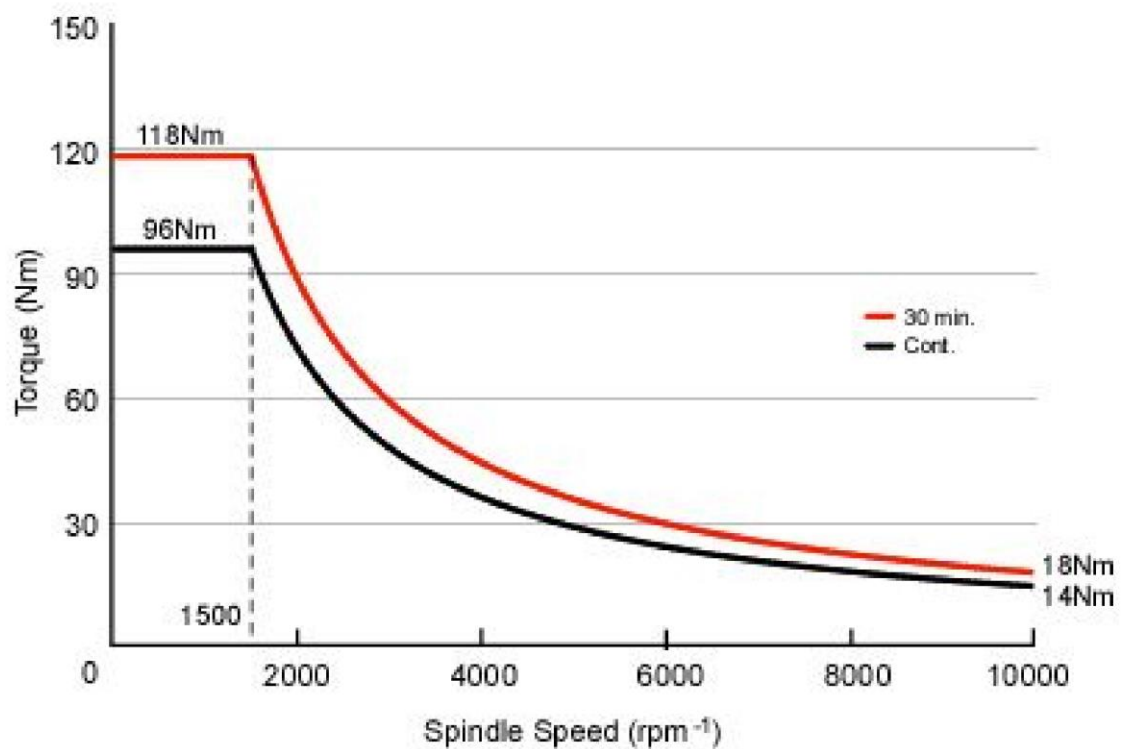
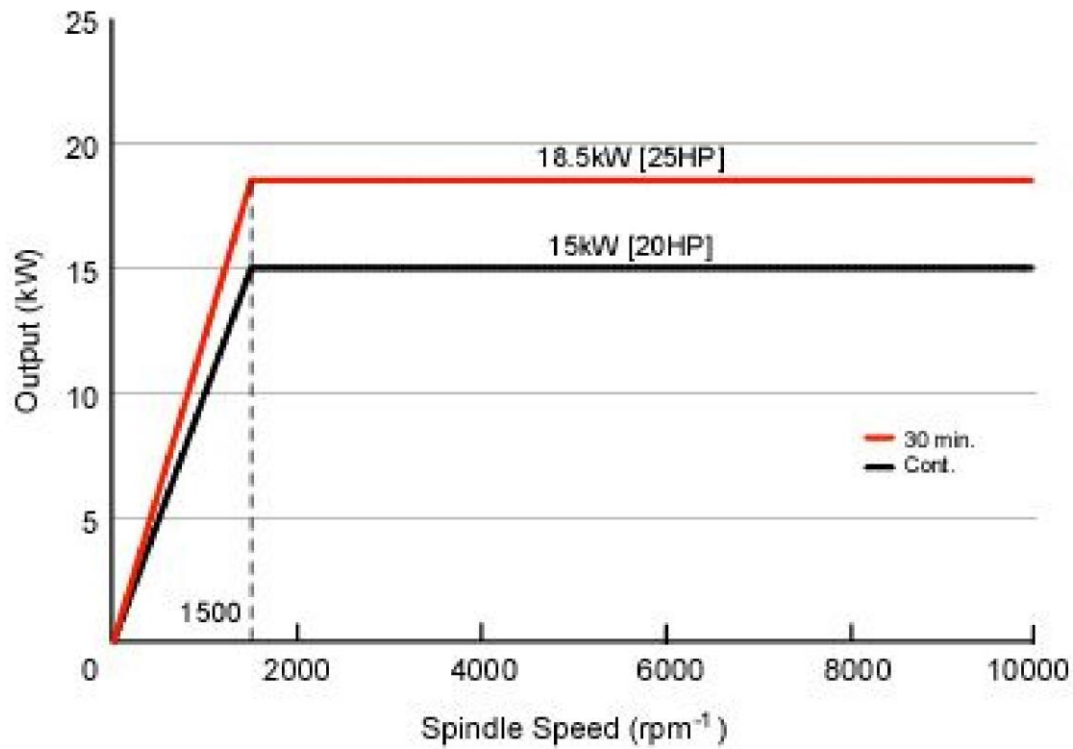


NO.	APPLICATION	LOCATION	MODEL (MAKER)
LS16	Waiting pot at magazine	Hydraulic cylinder for 90° swing of waiting pot	AX115 (TAIYO)
LS17	Waiting pot at double arm	Hydraulic cylinder for 90° swing of waiting pot	AX115 (TAIYO)
LS50	Single arm at initial position	Hydraulic cylinder for back and forth movement of single arm	AX115 (TAIYO)
LS51	Single arm at magazine pot	Hydraulic cylinder for back and forth movement of single arm	AX115 (TAIYO)
LS52	Single arm at waiting pot	Hydraulic cylinder for back and forth movement of single arm	AX115 (TAIYO)
LS53	Tool presence check at magazine pot		HP800-T2L-L05 (AZBIL)
LS54	Tool presence check at waiting pot		HP800-T2L-L05 (AZBIL)
LS55	Single arm has pulled Tool out.	Hydraulic cylinder for up and down movement of single arm	AX115 (TAIYO)
LS56	Single arm has inserted Tool.	Hydraulic cylinder for up and down movement of single arm	AX115 (TAIYO)

T. SPINDLE SPEED AND OUTPUT/TORQUE

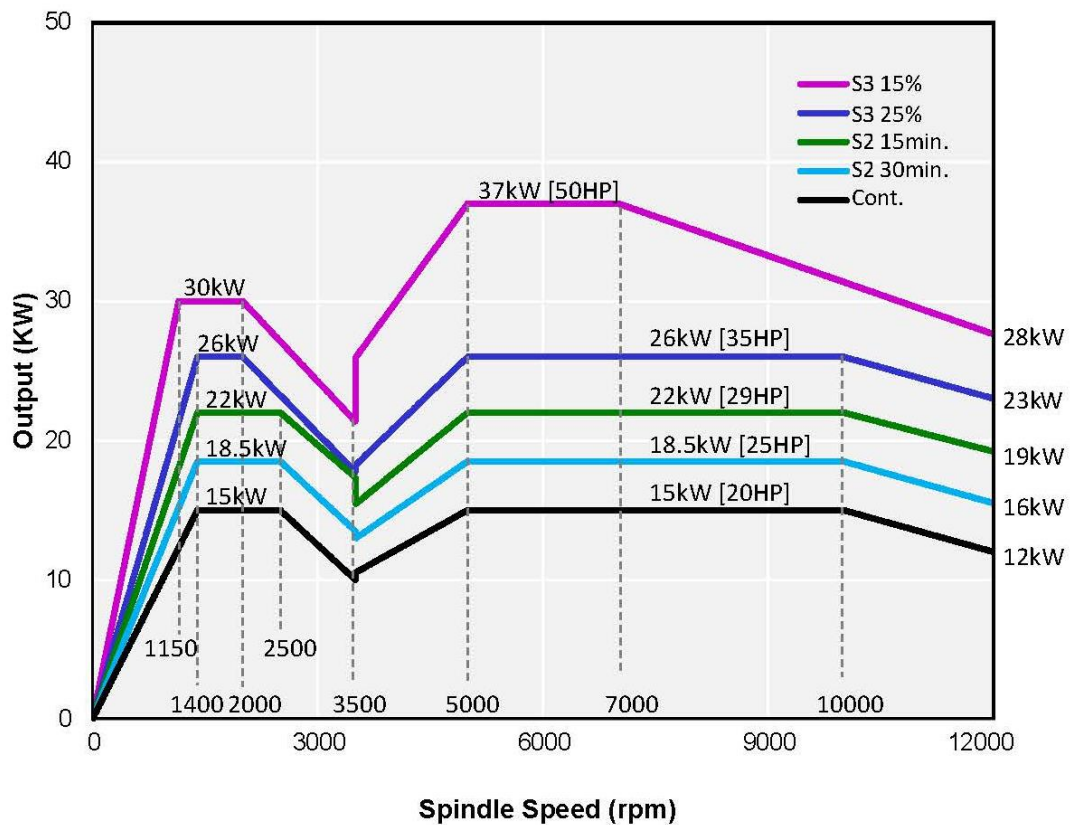
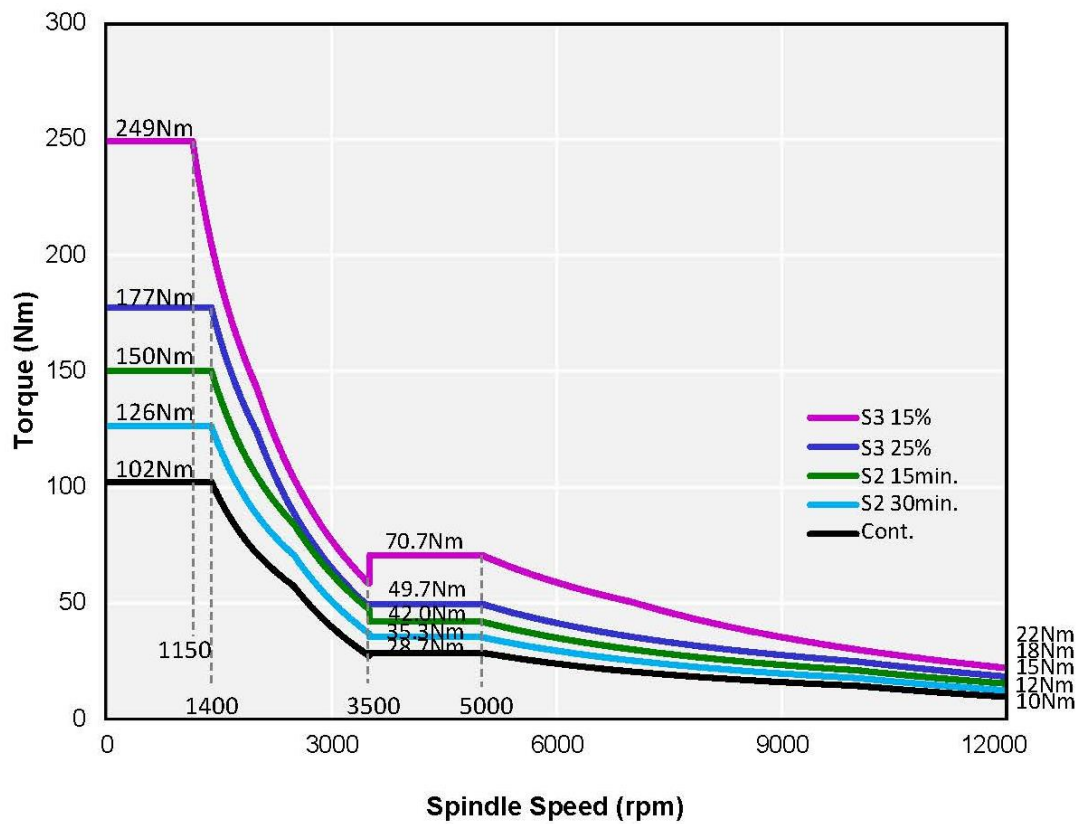
T. SPINDLE SPEED AND OUTPUT/TORQUE

T-1 10,000 min⁻¹



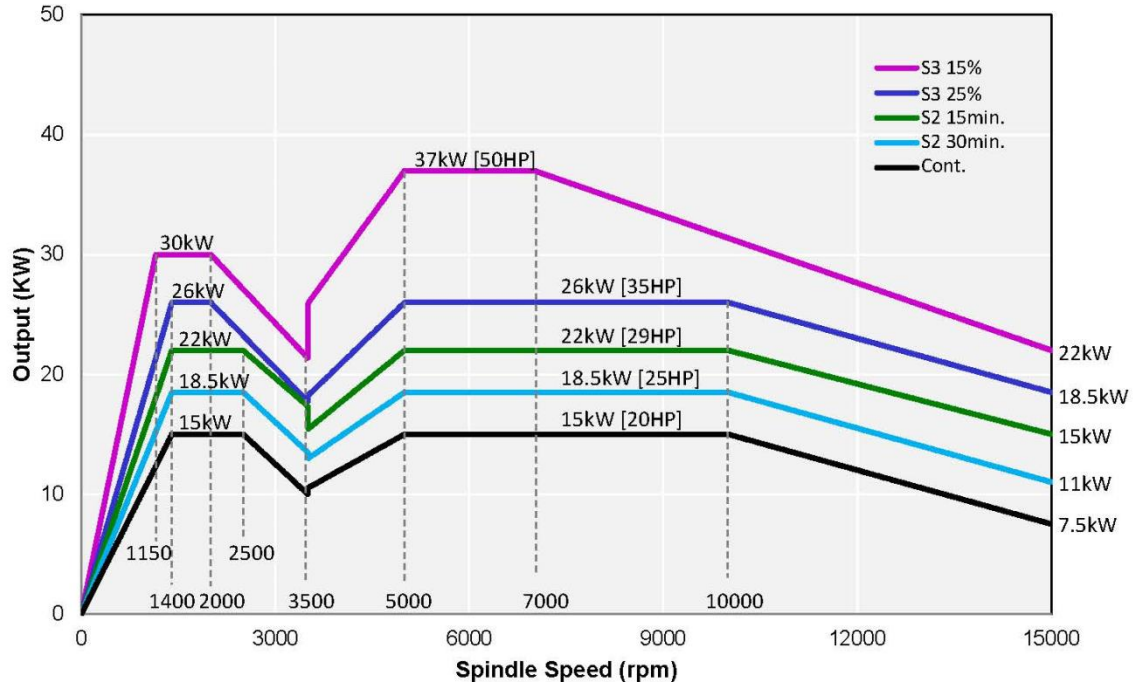
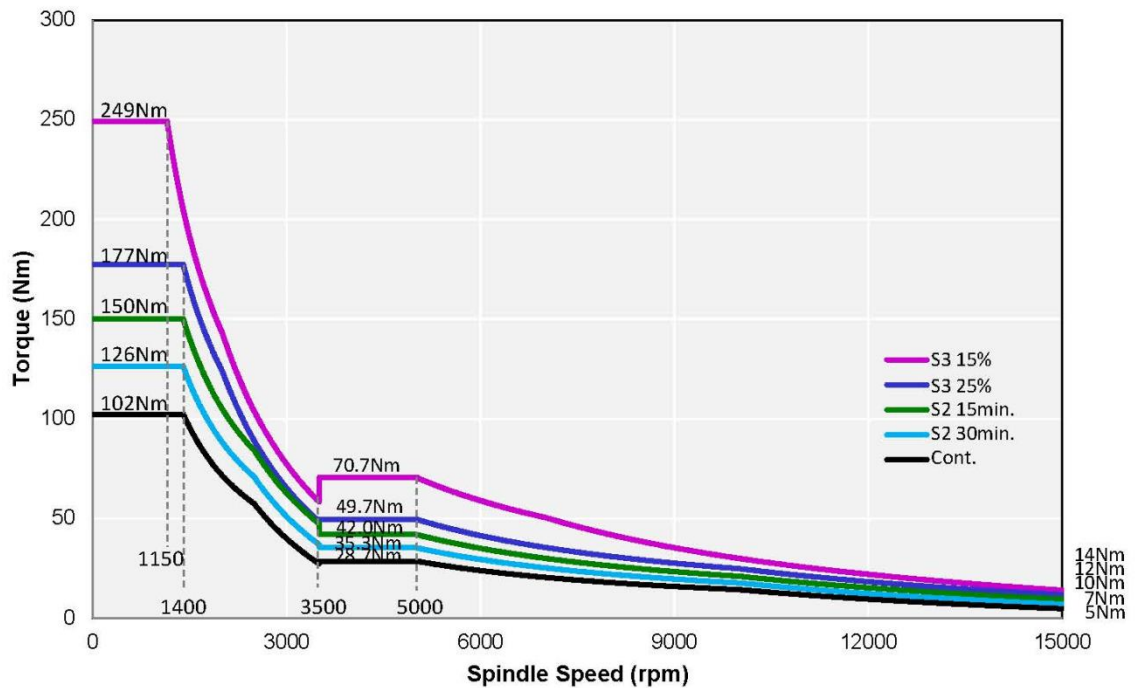
T. SPINDLE SPEED AND OUTPUT/TORQUE

T-2 12,000 min⁻¹



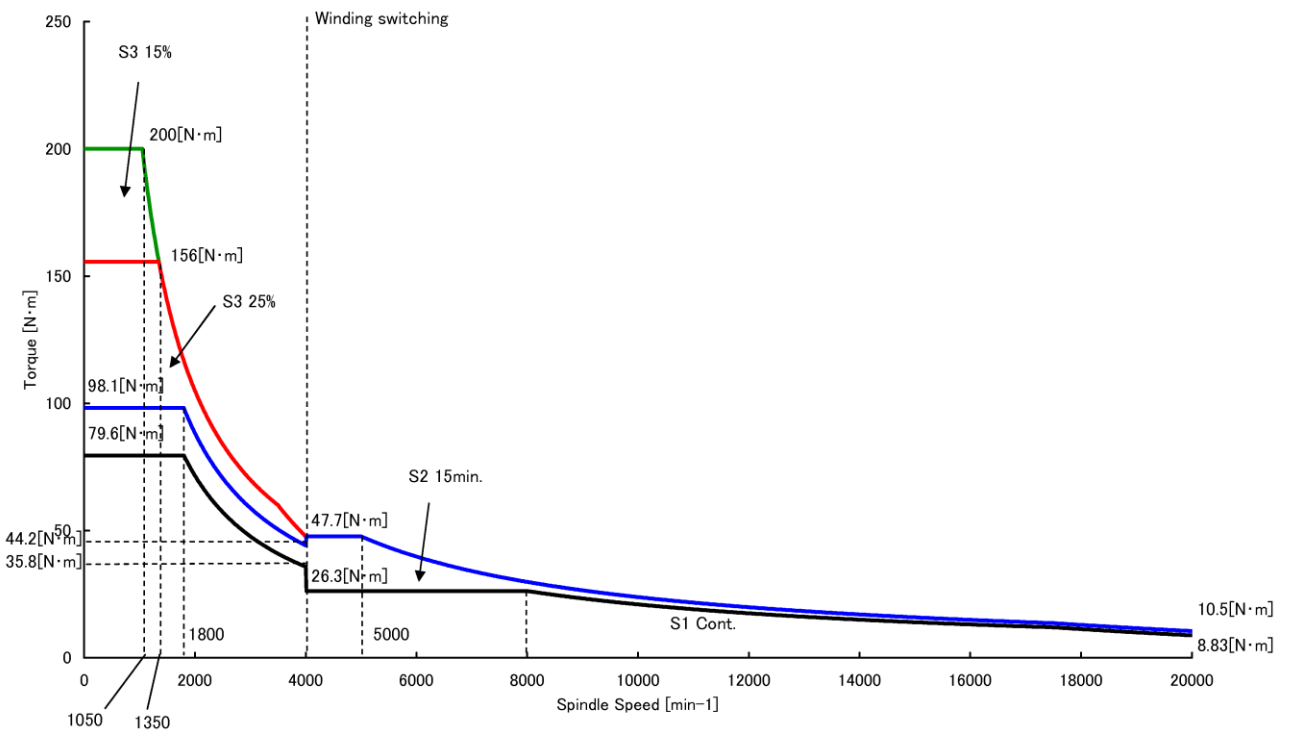
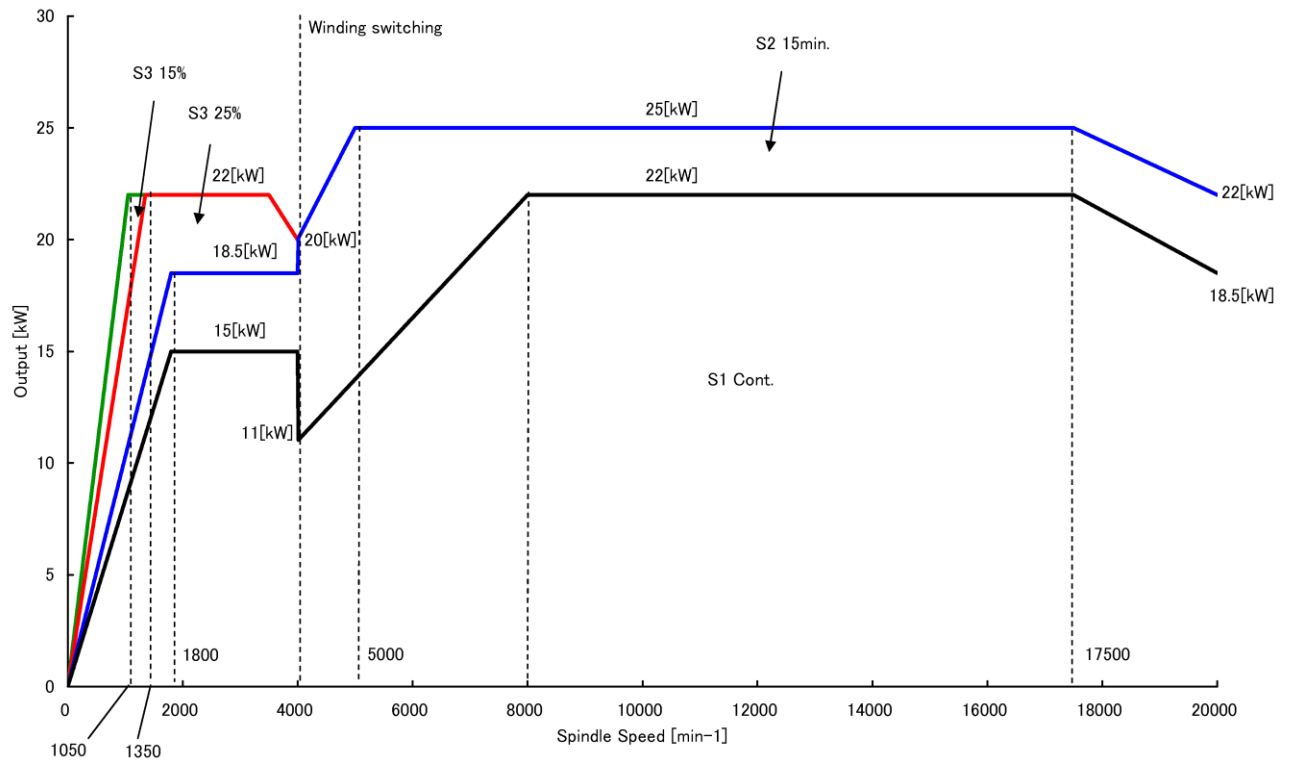
T. SPINDLE SPEED AND OUTPUT/TORQUE

T-3 15,000 min⁻¹



T. SPINDLE SPEED AND OUTPUT/TORQUE

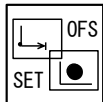
T-4 20,000 min⁻¹



U. ADJUSTMENT

U. ADJUSTMENT

U-1 Keep Relay Setting



1. Select the MDI mode by pressing MDI Mode Pushbutton (4).

2. Press function key [OFS/SET].

3. Press soft key [SETTING] to display the setting data screen.

This screen consists of several pages.

Press page key [↑PAGE] or [↓PAGE] until the setting data screen is displayed.

```
SETTING (HANDY)          O0001N00000
PARAMETER WRITE = 1 ( 0 : DISABLE  1 : ENABLE )
TV CHECK           = 0 ( 0 : OFF    1 : ON )
PUNCH CODE        = 1 ( 0 : EIA    1 : ISO )
INPUT UNIT        = 0 ( 0 : MM     1 : INCH )
I/O CHANNEL       = 4 ( 0-3 : CHANNEL NO. )
SEQUENCE NO.     = 0 ( 0 : OFF    1 : ON )

>
MDI **** *
[OFFSET] [SETTING] [WORK] [ ] [ (OPRT) ]
```



OR



4. Move the cursor to "PARAMETER WRITE" by pressing cursor keys.

5. Press soft key [(OPRT)], [1: ENABLE] in this order and the parameter writing becomes enabled.

CNC enters a P/S Alarm (No. 100) status.



6. Press function key [SYSTEM].

7. Press soft key [>] twice, [PMC MNTE], [>] several times and [KEEPRL] in this order and the Keep Relay data screen is displayed.

U. ADJUSTMENT

Keep Relay Screen (e.g. K57.2)

PMC PRM (KEEP RELAY)			MONIT RUN			ADDRESS for sequence program
NO.	ADDRESS	DATA	NO.	ADDRESS	DATA	
01	K40	00000000	11	K50	00000000	K57.2 (Keep Relay No. 57.2 bit)
02	K41	00000000	12	K51	00000000	
03	K42	00000000	13	K52	00000000	
04	K43	00000000	14	K53	00000000	
05	K44	00000000	15	K54	00000000	
06	K45	00000000	16	K55	00000000	
07	K46	00000000	17	K56	00000000	
08	K47	00000000	18	K57	00000000	
09	K48	00000000	19	K58	00000000	
10	K49	00000000	20	K59	00000000	
[TIMER] [COUNTER] [KEEPRL] [DATA] []						

Note: Keep Relays (K900 to K919) are used by PMC System. Do not change these Keep Relays.

1

INPUT

8. Move the cursor to K57 and press Cursor key [→] to highlight the sixth "0." This is Keep Relay K57.2. Press [1] then [INPUT].

9. Return to the setting data screen.
Move the cursor to "PARAMETER WRITE".
Press soft key [(OPRT)], then [0: DISABLE].

RESET

10. To release alarm status, press [RESET] key.

11. After adjustment of Pallet changing arms for example, return Keep Relay No. K57.2 to "0" from "1".

U. ADJUSTMENT

U-2 Backlash Compensation

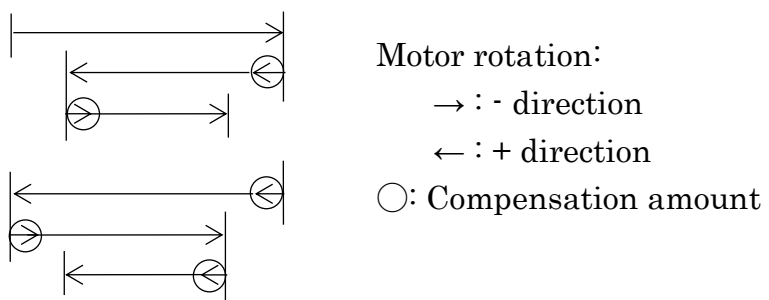
This is a function which compensates the mechanical backlash, generated when a shaft reverses its rotational direction. This compensation is made by programming a compensation amount previously measured in pulses by the counter of the NC.

Setting of Backlash Compensation

1. Principle

When feed direction is changed in automatic or manual operation, the motor rotates antecedently in the new feed direction by the number of pulses previously set, before executing the feed command. The mechanical backlash is compensated in this way.

However, when the power is turned off, the previous feed direction is cleared from the memory. Therefore, it is arranged that, every time the power is turned on, the previous feed direction is automatically regarded “+ direction”. Consequently, if a - direction feed is commanded just after turning the power on, the backlash compensation will work.



The backlash compensation amounts are determined by repeating the backlash measurement after the mechanical feeding system is properly adjusted.

U. ADJUSTMENT

2. How to set backlash compensation amount

Backlash compensation amounts are set by the MDI panel operation. The compensation amounts have been already set and strictly checked before delivery. However, if the machine is disassembled for repair in your shop, they must be reset after that. For this setting, refer to FANUC's "Parameter Manual", or contact your dealer.

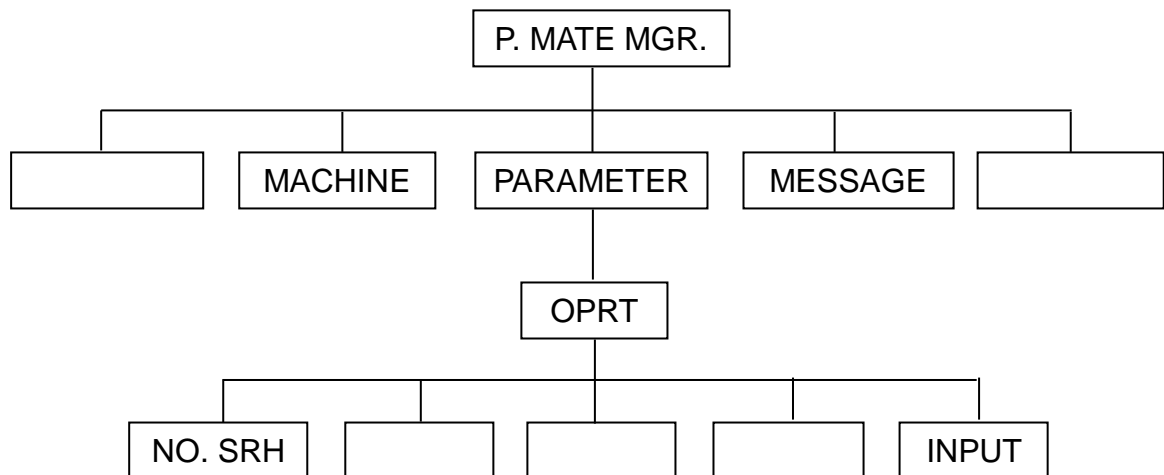
U. ADJUSTMENT

U-3 Reset of Zero Point of ATC Magazine

(1) Beta Screen and Beta Servo Parameter Setting



1. Press **SYSTEM** key on NC panel.
2. Press Soft key [▷] at the right end several times. Soft key [P. MATE MGR.] will be displayed at the bottom of LCD.
3. Press Soft key [P. MATE MGR.] to display Beta screen.



Note: When you pressed a wrong soft key, press Soft key [<] to return to the previous display of Soft keys.

U. ADJUSTMENT

Description of Soft keys

[MACHINE] Displays the present position in Machine coordinate system.

[PARAMETER] Displays Parameter screen for the Beta servo.

Pressing [OPRT] will display [NO. SRH]. Directly key in Parameter No. to be set, and then press Soft key for [NO. SRH] to move the cursor to the desired Parameter No. Enter a new parameter and press Soft key [INPUT]. The new parameter will be set in NC.

Note: Some parameters will not be renewed until NC power is turned off. In such a case, turn NC power off and turn it on again.

[MESSAGE] Displays Beta servo alarm message No.

[NO. SRH] To search Parameter No. you have keyed in.

[INPUT] To set the entered parameter in NC.

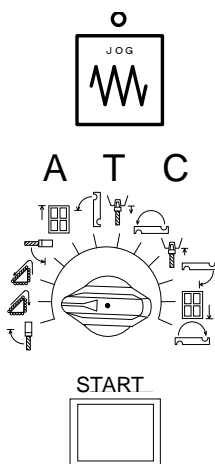
U. ADJUSTMENT

(2) Zero Point Return Setting of Magazine

1. Set Keep relay No. K30.0 to “1” to enable Beta servo Zero point return. K30.0 means the first figure from right in the eight figures. (Refer to “Keep Relay Setting” in U-1).
2. Check that the ATC door for setting tools on the machine left side is closed.
Check that Servo alarms 000, 224, 319 and 350 are displayed on [MSG] screen, or the LED indication on the Beta servo unit (319 and 350 are not always displayed), and turn NC power off once. Then turn NC power on again. Servo alarms 000 and 350 will disappear. For Alarm display, refer to Section (1).

Alarm code (LCD)

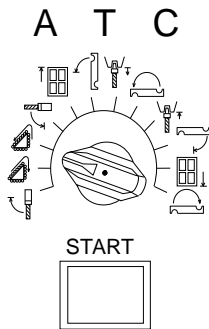
000
224
319
350



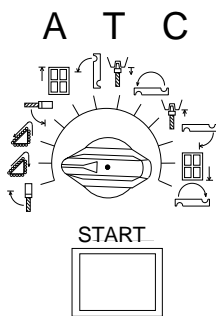
3. Press JOG Mode pushbutton (6), set ATC manual operation switch (94) to “Magazine rotation clockwise” and press ATC manual start pushbutton (95) until Tool pot No. 1 comes to the ATC position (where the pot can be transferred to the double arm side).

Note: If Tool pot No. 1 is already in the ATC position, this Step No. 3 is not necessary.

U. ADJUSTMENT



4. Set ATC manual operation switch (94) to “Magazine rotation counterclockwise” and press ATC manual start pushbutton (95) to move the magazine by 3 pots counterclockwise.

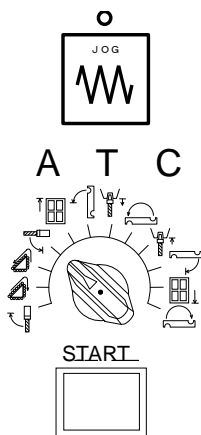


5. To release Servo alarm 319 if any, turn NC power off, and turn NC power on again. Then set ATC manual operation switch (94) to “Magazine rotation clockwise.” By pressing ATC manual start pushbutton (95), move the magazine by 2 pots clockwise.



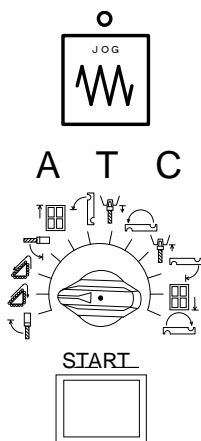
6. Press Zero point return mode pushbutton (8) to light its lamp on, and then keep pressing ATC manual start pushbutton (95) until the magazine stops. Now check the position of the actual magazine (not the display), and it will be before the correct position. Then keep pressing ATC manual start pushbutton (95) again until the magazine stops, and check the position. By repeating this, the magazine will finally stop at the correct position.
7. Check that the display of Beta position (in the Machine coordinate system) shows “0” [refer Section (1)]. If it is not “0” repeat Steps 4 to 7 above. Then press [RESET] pushbutton on the NC panel, and the magazine zero point will be set and Servo alarm 224 will disappear.

U. ADJUSTMENT



8. Press JOG Mode pushbutton (6), set ATC manual operation switch (94) to "Tool Pot on Double Arm Side" and press ATC manual start pushbutton (95). Check if the tool pot moves to the double arm side smoothly.

9. Set Keep relay No. K30.0 back to "0" in MDI Mode.



10. Press JOG Mode pushbutton (6), set ATC manual operation switch (94) to "Magazine rotation clockwise," and press ATC manual start pushbutton (95). Check that the magazine will stop correctly (not in between).

<Grid Shift>

If the magazine does not stop correctly, adjustment of Parameter No. 181 (grid shift) is necessary.

Note: If the machine has a 6-pallet APC, select the screen of 1. GROUP2/Beta (the screen of 2. GROUP5/Beta is for the 6-pallet APC).

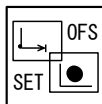
Adjustment of Parameter No. 181

Return to Step No. 1 to change Keep relay No. K30.1 to "1" again, and adjust the value of Parameter No. 181 in the following way:

U. ADJUSTMENT

- a) If the magazine goes too far, decrease the value for Parameter No. 181.
- b) If the magazine stops short of the expected point, increase the value for Parameter No. 181.

After changing Parameter No. 181, repeat Steps 2. to 12. until the magazine stops at the right place.



11. Press [OFS/SET] pushbutton on the NC panel, and change "PARAMETER WRITE =" from "1" to "0."

Note 1: Above procedure is effective only when the parameters of both CNC and Beta servo unit are not lost. If these parameters have been lost, Zero point return of ATC magazine can not be done by these steps. In such a case, please contact your dealer for repair.

Note 2: Please replace batteries of the absolute pulse coder for the tool pot magazine once a year (see Section Q-5 of this manual).

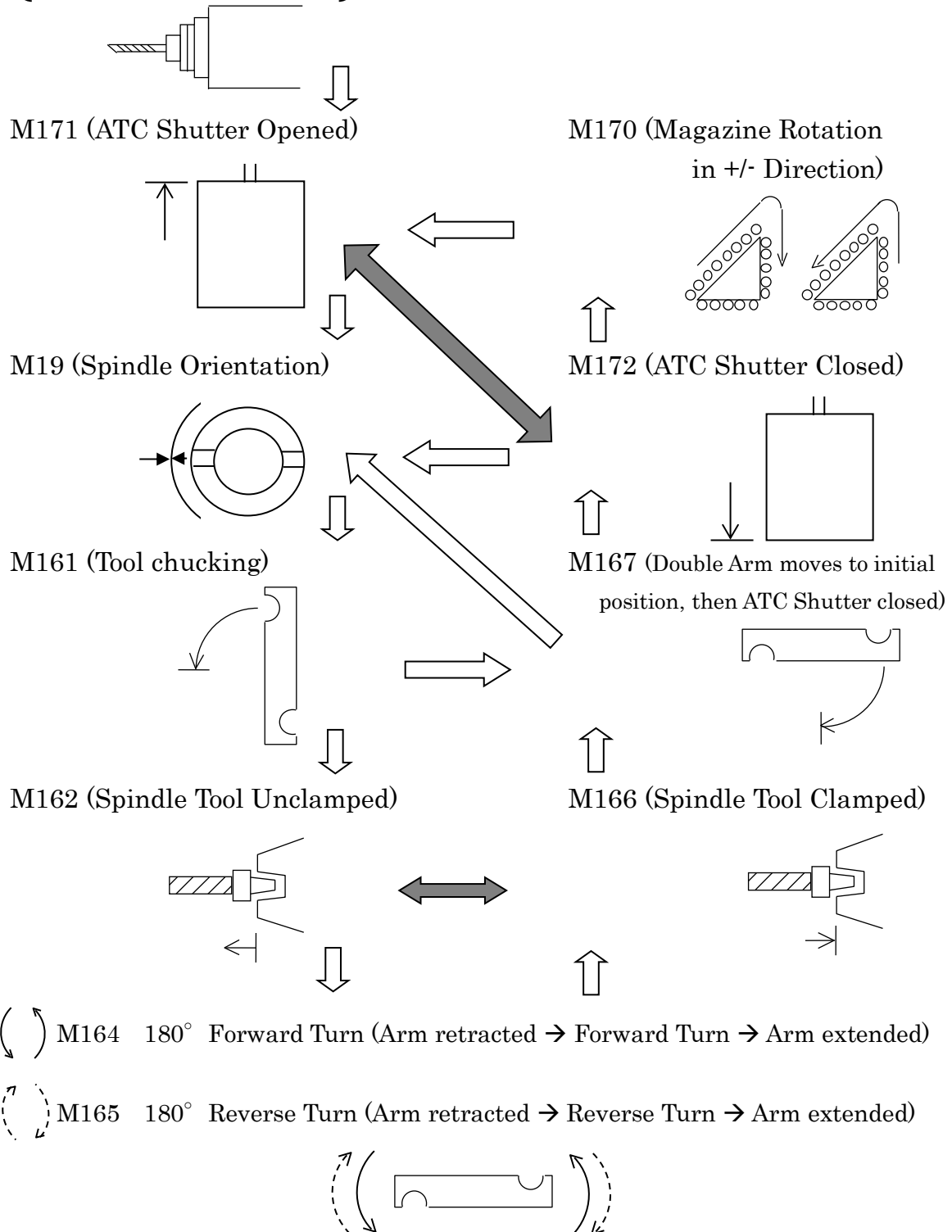
U. ADJUSTMENT

U-4 Single Step of ATC Operation

(Restoration of ATC when ATC is stopped in trouble)

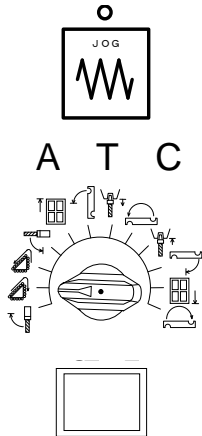
Step chart of ATC operation

$\left(\begin{array}{lll} \text{G91 G28 Z0;} \\ \text{G91 G30 X0 Y0;} \end{array} \right)$ Spindle moves to the ATC position.



U. ADJUSTMENT

Single Step ATC Operation by ATC Manual Operation Box



1. Perform Z-axis Zero Point Return (G91 G28 Z0;), X-, Y-axis second point return (G91 G30 X0 Y0;) and spindle orientation (M19).
2. Press JOG Mode pushbutton (6).
3. Select an action by ATC manual operation switch (94). Please refer to Section C-3 (94) of the Operation manual for the meanings of the symbols.
4. Press ATC Manual Start pushbutton (95). The selected ATC movement is started.

Note: If double arm cannot be returned to the home position by these steps, please refer to the next section.

U. ADJUSTMENT

U-5 How to Bring Double Arm to Home Position



WARNING

This adjustment is to be done by qualified personnel.

1. Set Keep Relay K82.7 for "1". (ATC arm can be operated by MPG.) K82.7 is the left most figure of the eight.
2. Press SYSTEM > [PMC] > [PARAMETER] > [DATA] to display the following screen.

PMC MAINTENANCE RUN *** 00000 N00003

PMC DATA TABLE CONTROL (PAGE 1/ 1)

GROUP TABLE COUNT 8

NO.	ADDRESS	PARAMETER	TYPE	DATA	NO.	ADDRESS	PARAMETER	TYPE	DATA
1	D5100	00000000	1	151					
2	D0700	00000000	2	20					
3	D0500	00000000	1	13					
4	D1000	00000000	1	32					
5	D9000	00000000	2	4					
6	D0004	00000000	1	1					
7	D9300	00000000	1	1					
8	D0600	00000000	0	16					

D5100 : SPTNO (SPINDLE TOOL NO.)

A>^

MDI STOP *** 09:53:46

< SWITCH ZOOM G. CONT NO. SRH SYMBOL INIT PARAM TYPE +

3. Press [ZOOM] to display the data table screen, and press [PAGE] several times to display the following screen.

PMC MAINTENANCE RUN *** 00000 N00003

PMC PARAM (DATA TABLE) (PAGE 1/ 1)

GROUP NO. 2 D0700 SIGN DEC:DWORD NO PROTECT (WA A POSITION ON ANGLE<DEG>)

NO.	ADDRESS	DATA	NO.	ADDRESS	DATA	NO.	ADDRESS	DATA
0	D0700	355000	12	D0748	100000			
1	D0704	94000	13	D0752	285000			
2	D0708	61000	14	D0756	150000			
3	D0712	299000	15	D0760	220000			
4	D0716	278000	16	D0764	0			
5	D0720	5000	17	D0768	77482			
6	D0724	15000	18	D0772	286896			
7	D0728	255000	19	D0776	110000			
8	D0732	60000						
9	D0736	270000						
10	D0740	30000						
11	D0744	275000						

D0764 : WAPOS (WA MACHINE POSITION)

A>^

MDI STOP *** 09:54:08

< SWITCH LIST G-SRH SEARCH

U. ADJUSTMENT

4. Select the 5th axis on the manual pulse generator, and move the ATC arm until D764 (current ATC arm position) becomes zero (Home position).
5. Set Keep Relay K82.7 back to "0".



Be careful of the ATC shutter! When the NC gets ready, the ATC shutter will be closed AUTOMATICALLY.

U. ADJUSTMENT

U-6 Zero Point Setting of Axes

An absolute type encoder is used for positioning of each axis on this machine, so usually there is no need to execute zero point return after turning power on the machine. However in the following cases, execution of zero point return will be necessary for axes.

NC is powered off and

- you change Servo motor signal cable with new one.
- connector of Servo motor signal cable is disconnected.
- Servo motor signal cable is damaged.
- Absolute encoder batteries get low.
- CNC back-up batteries get low.

In this case, when power is on, LCD shows FANUC Alarm No.300 requiring Reference Point Return.

NC is powered on and

- connector of Servo motor signal cable is disconnected.
- Servo motor signal cable is damaged
- connector of Servo motor signal cable has bad contact and Alarm is generated.

In this case, the machine gets in Servo Alarm status. After turning off and removing the cause, turn power on again. FANUC Alarm No.300 which requires Reference Point Return is generated.

U. ADJUSTMENT

In any other situation where Servo motor loses its zero (reference) point data, FANUC Alarm No.300 which requires Reference Point Return is generated. In this case, perform Zero (Reference) Point Return on the required axis.

In order to set Zero point for each axis, Zero point plates are attached to each axis. In Zero Point setting, refer to these plates.

X-axis Zero Point Plates:

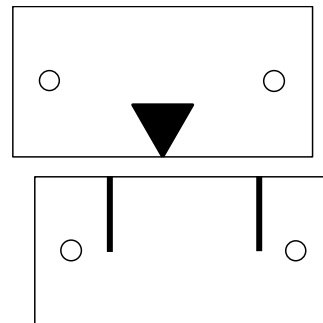
Bed and Column

Y-axis Zero Point Plates:

Column and Spindle head

Z-axis Zero Point Plates:

Bed and Rotary table

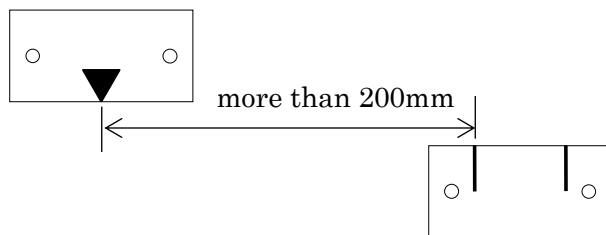


U. ADJUSTMENT

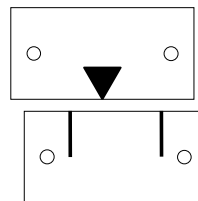
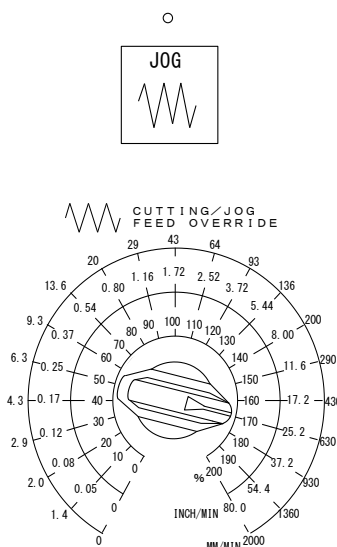
1) X, Y and Z axes

Procedure

1. Press HANDLE Mode pushbutton (5), and select the axis with Manual Pulse Generator (79).
2. Move axis in minus direction so that Zero Point plate (Pointer) and Zero Point plate (2 lines) have distance of more than 200mm.



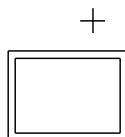
3. Press JOG Mode pushbutton (6). Select the axis feed speed of 630mm/min. with Feed Rate Override and JOG Feed Setting switch (69). Move the axis with Plus Direction Feed pushbutton (78) so that the Pointer of the Zero Point plate comes a little short of the center of the 2 lines on the other Zero Point plate.



Note: Move axis only in plus direction.

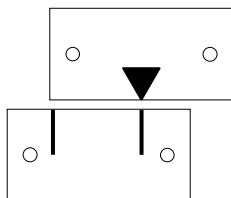
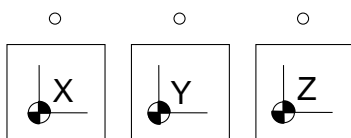
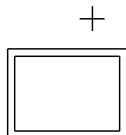
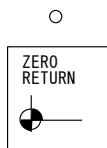
During the approach, the speed should reach 500mm/min. at least for a moment.

In case that the pointer of Zero Point plate exceeds the two lines of Zero Point plate, perform Zero Point setting from Step 1.



U. ADJUSTMENT

4. Press Zero Point Return Mode pushbutton (8).
Keep pressing Plus Direction Feed pushbutton (78) until the axis stops at the Zero Point.



The Zero Point Return completion lamp lights.
The pointer of Zero Point plate is at the line of plus side of the other Zero Point plate.

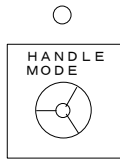
Check that the machine coordinate of the axis is "0".

5. Press [RESET] key.

U. ADJUSTMENT

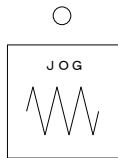
2) B axis

In order to set zero point, zero point marks are provided on the body of rotary table and turn table.

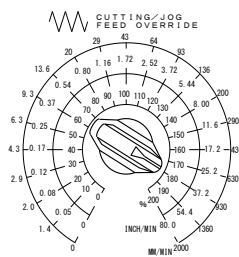


1. Press Handle Mode pushbutton **(5)** and select B axis by Manual Pulse Generator **(79)**.

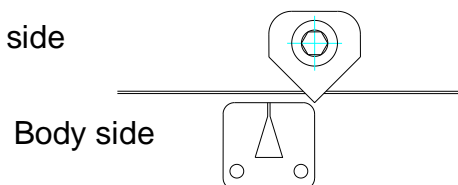
2. Rotate the rotary table about 45 deg. (Either clockwise or counter clockwise direction).



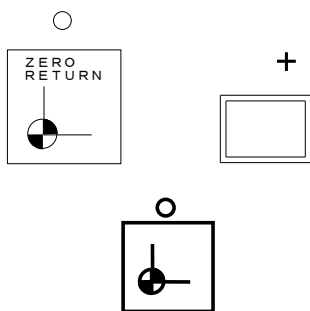
3. Press JOG Mode pushbutton **(6)** and select B axis on the main operation panel. Select the axis feed speed of 630mm/min. with Feed Rate Override and JOG Feed Setting switch **(69)**. Move the axis with Plus Direction Feed pushbutton **(78)** so that the Pointer of the Zero Point plate comes a little short of the center of the mark on the other Zero Point plate as below.



Turn Table side



U. ADJUSTMENT



4. Press Zero Point Return pushbutton (8).

Keep pushing the Plus Direction Feed pushbutton (78) until axis rotation stops at the zero return position and the B axis Zero Point Return Completion lamp (24) is on.

Note: Once a machine zero point is set, it becomes impossible to set the machine zero point again. To do it one more time, set Parameter No. 1815#4 (APZx) at “0”, and after turning the machine off, turn it on and set the zero point from the beginning (when you turn the machine on, the alarm No. 300 appears to request zero point setting).



5. Press [RESET] key.

U. ADJUSTMENT

Zero Point Setting of ATC Arm

Find the starting and ending positions of ATC arm rotation by D764 (current ATC arm position), and set the zero point at the middle position.

1. Set Keep Relay K54.7 for "1". (ATC arm can be operated by MPG.) K54.7 is the left most figure of the eight.
2. Press SYSTEM > [PMC] > [PARAMETER] > [DATA] to display the following screen.

PMC MAINTENANCE
RUN *** 00000 N00003

PMC DATA TABLE CONTROL (PAGE 1/ 1)

GROUP TABLE COUNT 8

NO.	ADDRESS	PARAMETER	TYPE	DATA	NO.	ADDRESS	PARAMETER	TYPE	DATA
1	D5100	00000000	1	151					
2	D0700	00000000	2	20					
3	D0500	00000000	1	13					
4	D1000	00000000	1	32					
5	D9000	00000000	2	4					
6	D0004	00000000	1	1					
7	D9300	00000000	1	1					
8	D0600	00000000	0	16					

D5100 : SPTNO (SPINDLE TOOL NO.)

A>^

MDI STOP *** 09:53:46

< SWITCH ZOOM G. CONT NO. SRH SYMBOL INIT PARAM TYPE +

3. Press [ZOOM] to display the data table screen, and press [PAGE] several times to display the following screen.

PMC MAINTENANCE
RUN *** 00000 N00003

PMC PARAM (DATA TABLE) (PAGE 1/ 1)

GROUP NO. 2 D0700 SIGN DEC: DWORD NO PROTECT (WA A POSITION ON ANGLE(DEG))

NO.	ADDRESS	DATA	NO.	ADDRESS	DATA	NO.	ADDRESS	DATA
0	D0700	355000	12	D0748	100000			
1	D0704	94000	13	D0752	285000			
2	D0708	61000	14	D0756	150000			
3	D0712	299000	15	D0760	220000			
4	D0716	270000	16	D0764	0			
5	D0720	5000	17	D0768	77482			
6	D0724	15000	18	D0772	286896			
7	D0728	255000	19	D0776	110000			
8	D0732	60000						
9	D0736	270000						
10	D0740	30000						
11	D0744	275000						

D0764 : WAPOS (WA MACHINE POSITION)

A>^

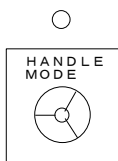
MDI STOP *** 09:54:08

< SWITCH LIST G-SRH SEARCH

U. ADJUSTMENT

4. If you keep rotating the motor the ATC arm will move as follows:

→Stop→Rotation→Stop→Shaft out/Rotation/Shaft in→Stop→Rotation...



5. Press Handle Mode pushbutton, and select the 5th axis on the MPG. Move the ATC arm to the beginning and ending positions of the above stop area of the shaft (underlined) and read the values of D764, then find its middle position.
6. Move the ATC arm to the calculated middle point; this is the zero point of the ATC arm.
7. Press Emergency stop pushbutton and turn NC power off. Turn NC power on again and change Parameter No. 1815#4 (APZx) of ATC arm shaft to “1”.

PARAMETER

00000 N00003

01812		01813		01814		01815		01816		01817	
X	0	X	0	X	0	X	0	RON	APC	APZ	DCR
Y	0	Y	0	Y	0	Y	0	DM3	DM2	DM1	HPE
Z	0	Z	0	Z	0	Z	0	TAN	SCP	SCR	SBL
B	0	B	0	B	0	B	0				
WA	0	WA	0	WA	0	WA	0				
01812		01813		01814		01815		01816		01817	
X	0	X	0	X	0	X	0	RON	APC	APZ	DCR
Y	0	Y	0	Y	0	Y	0	DM3	DM2	DM1	HPE
Z	0	Z	0	Z	0	Z	0	TAN	SCP	SCR	SBL
B	0	B	0	B	0	B	0				
WA	0	WA	0	WA	0	WA	0				

MDI STOP *** 09:54:45

NO. SRH ON: 1 OFF: 0 +INPUT INPUT F INPUT F OUTPUT

8. Change Keep Relay K K82.7 back to “0”.

APPENDIX VII (SPINDLE THROUGH COOLANT SYSTEM)

APPENDIX VII

SPINDLE THROUGH COOLANT SYSTEM

[Also refer to Q-4 “Trochoid Pump (Option)” of this manual.]

By the following procedure this system functions.

1) M Code

M11: Coolant starts

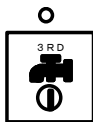
M12: Coolant stops

M06, M106: Coolant stops (coolant command terminated) then Tool Change

Note 1: Movement of M06 or M106 with Spindle Through Coolant System requires a little more time than that without Spindle Through Coolant System.

Note 2: At M12, air blow is applied to clear the way.

2) 3rd Coolant Select pushbutton



- Manual Operation

When this pushbutton is pressed, coolant fluid starts to flow out and the lamp is lit. Second pressing stops the coolant fluid and the lamp goes off.

- In case Automatic or MDI Operation starts while coolant fluid flows out:

To stop coolant fluid after a program starts while coolant fluid flows out, press this pushbutton which is lit on. Or input M12 (M code to stop coolant) in the program beforehand.

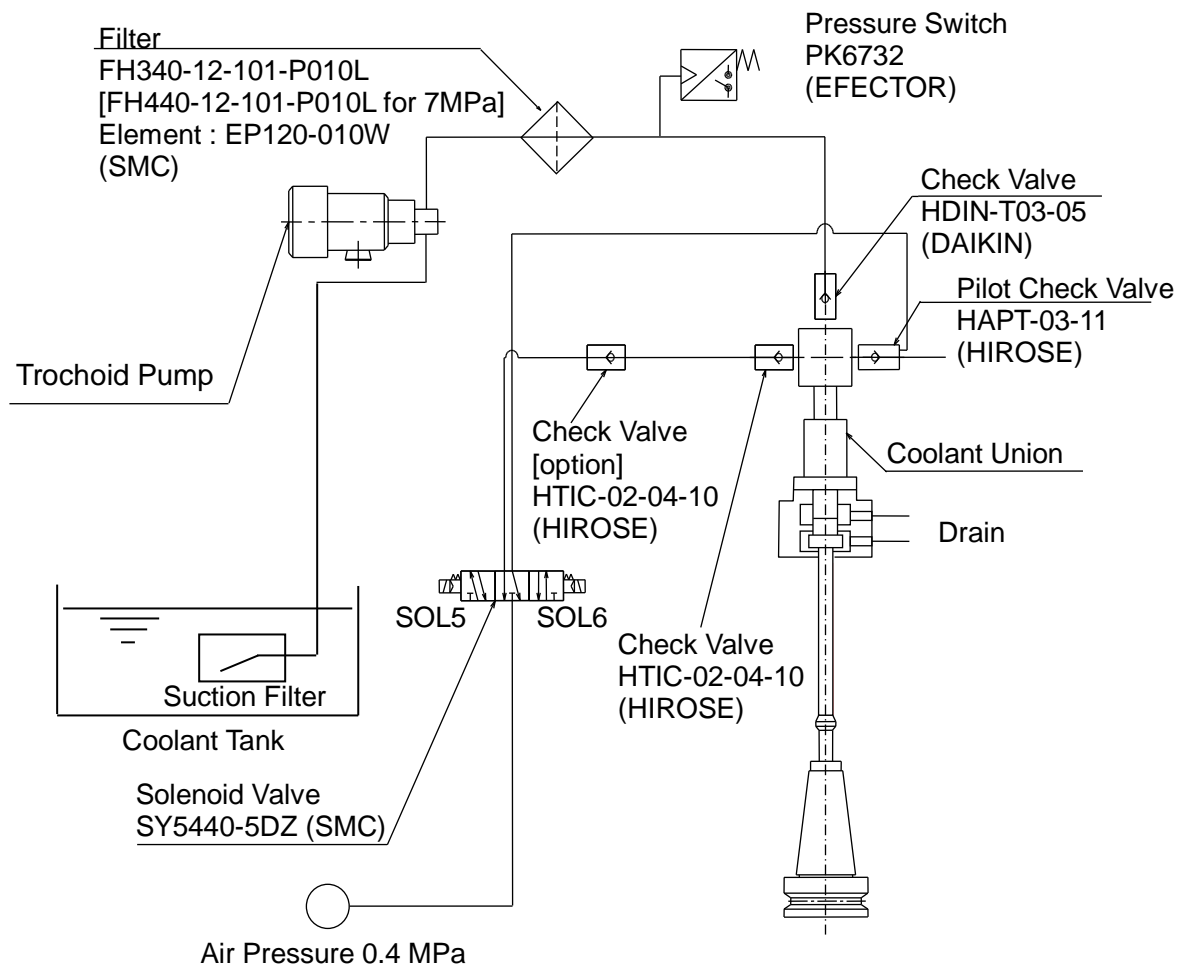
When pressing this button again, coolant fluid starts again.

APPENDIX VII (SPINDLE THROUGH COOLANT SYSTEM)

- In case Automatic or MDI Operation starts while coolant fluid stops:

To start coolant fluid flowing out, press this pushbutton. Or input M11 (M code to start coolant) in the program beforehand.

Piping Circuit of Spindle Through Coolant System



APPENDIX VII (SPINDLE THROUGH COOLANT SYSTEM)

40-bar System (Option)

